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ABSTRACT

It is often stated that science does not have a central place in the elementary school curriculum, unlike other subjects such as reading, writing, and arithmetic. In response to this concern, a project in Indiana is underway to develop a variety of approaches which integrate new materials, methods, and modes of teaching into the elementary school curriculum of a consortium of school districts. This document is one result of the project. It contains a compendium of teaching strategies and special activities which elementary teachers may include in their elementary school curriculum. The document contains separate sections which deal with: (1) a language arts approach to science; (2) using reading books to teach science; (3) science basics for elementary teachers; (4) using the zoo as a classroom; (5) after school science enrichment; (6) Halley's comet; (7) a teacher science fair; and (8) audio science. Also included is an annotated bibliography of science books for children and a list of other references for the teacher. (TW)

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Project M.A.S.T.E.R

Making Room for Science in the Classroom

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Project
M.A.S.T.E.R

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Making Room for Science in the Classroom

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Introduction

INTRODUCTION

Everyone would agree that schools should promote a fundamental understanding of science. Yet, unlike the other basic subjects--reading, writing, and arithmetic-- science does not have a central place in the elementary school curriculum. Teachers themselves feel prepared to teach numerical concepts and the language arts. They make no such claims about their readiness to teach science. State requirements for "minutes" of science in the grade school day are minimal. In-service opportunities in science for elementary school teachers are rare. Elementary schools lack equipment and materials; school systems frequently have no elementary school science coordinator.

School systems do support science teaching. But the largest share of science resources, in terms of trained personnel, program development, and equipment, is invested in secondary schools. Sadly, secondary school faculty have little contact with elementary school science teachers and less information about the elementary science curriculum. Indeed, they complain that they can never be sure what students coming into secondary school science classes have been taught. The results are predictable: inequity of preparation and achievement is virtually guaranteed. A decline in science majors at the college level throughout the country gives more evidence of the long range effects of this basic science "gap".

M.A.S.T.E.R. I, a Title II project sponsored by the Indiana Commission for Higher Education and directed by the Community Education Roundtable of St. Joseph County in 1985-6, was designed to address this complex challenge. Because of the dimensions of the problem, our collegiate and pre-collegiate planning committee agreed that standard models--institutes and in-service workshops on science topics, excellent though they might be for individual participants--did not promise to change the situation. Instead, we proposed to use a variety of approaches which integrated new materials, methods, and modes of teaching and inquiry into the school year. Our central focus was the K-3 teacher, the professional most in need. Our central strategy was partnership: a pooling of available resources from community and classroom to raise awareness of science and enable teachers to achieve their own potential in science instruction.

This resource notebook is one result: a compendium of strategies, special activities which any district or school might adopt, and best of all, detailed suggestions developed by teachers themselves to "make room for science" in elementary school classrooms. We offer it in loose-leaf format, the work of many hands and open-ended, inviting future collaboration.

The Roundtable was aided by a wide variety of local resources in the multiple projects of M.A.S.T.E.R. I. Private and parochial school administrators, and the staff, department chairs and principals of three public school corporations (South Bend, Mishawaka, and Penn-Harris Madison) endorsed the project and carried out the job of participant selection. A creative planning committee gave us constructive criticism and detailed feedback. Our chief consultant, workshop leader, radio producer, and answer man was John V. Davis, science curriculum coordinator of the South Bend Community School Corporation. Many of the basic down-to-earth (and earthworm!) materials developed by "Mr. D." are included in this guide.

Representatives from higher education helped to plan and produce an exciting day-long conference midway through the project year. The first of its kind in this area, it put our participants in contact with national pioneers in the science/language arts approach. The working papers developed for Project M.A.S.T.E.R. by the Butzows of Indiana University of Pennsylvania and used at the conference are reproduced here for others to use; they provided both theory and practice.

Again the emphasis was inter-institutional, inter-curricular, and interdisciplinary. Professors from St. Mary's, Notre Dame, Bethel College, and Indiana University at South Bend offered workshops in content areas, and hands-on experience in writing, painting, and creating inexpensive science-teaching materials. Members of the Community Education Roundtable, our educational-business-professional partnership, as well as school administrators, were present throughout the day as observers and, at times, active participants! Materials from that conference are also included in this resource book. Teachers continue to tell us it was one of the most valuable of all M.A.S.T.E.R. events.

Other activities made possible through this partnership effort are described in this notebook. They include a Halley's Comet day planned to bring together the resources of our three public school planetaria and Library "Friends" from South Bend, Notre Dame, Mishawaka, Notre Dame, and IUSB. The M.A.S.T.E.R. project sponsored the keynote speaker, educational director of the Adler Planetarium in Chicago. Two Notre Dame professors spoke about their work on Mark Twain (who was born and died in years when the comet made earlier appearances) and on extra-terrestrial space. Hundreds of citizens in St. Joseph County, including teachers, attended that event, held in a community cultural center.

Science Fairs are a common event; ours was quite different, because it was held not for students but teachers! The honorary collegiate science society, Sigma Xi, sponsored a grand prize, and provided judges along with faculty from Notre Dame, St. Mary's, and the Zoological Society. The many projects were viewed not only by the general public (the event was held in our civic arena, Century Center) but by teachers themselves, who exchanged ideas to use in their own classrooms.

Again, field trips are a common vehicle for science teaching. With the excellent resources of the local Potawatomi Zoo and its educational director, Ben Miller, we brought teachers in for their own "safari" experiences, designed not only to acquaint them with the zoo as a facility, but to discuss how to turn a passive experience into a meaningful elementary school classroom activity. Miller's materials, included here, are adaptable for any community school district.

Directed by Dr. Eliot Rosen of Notre Dame, a group of M.A.S.T.E.R. teachers formed a curriculum design team to work on after-school science, an enrichment project for early grades. Their work is also included here; it will be implemented in local schools during 1986-7. The science radio programs developed by John Davis, assisted by other M.A.S.T.E.R. participants, are described in another section. Bulletin board materials and cross-reference of program units to basic science texts have also been developed.

The materials developed by M.A.S.T.E.R. elementary teachers, the first set of notebook resources, are the best illustration of the science/language arts approach to teaching elementary school science. They also suggest the value of empowering the classroom professional and providing a way to coordinate and disseminate teacher-generated ideas. M.A.S.T.E.R. representatives from 42 public, parochial and private schools met in workshops held after school around the area to design science activities using reading books. Teachers brought their own favorite readers; the young peoples' librarian of the South Bend Public Library provided a boxful of additional picture and story books. John Davis has compiled the results of their collaboration in this notebook. Similar workshops have become a standard activity for "Prime Time" public school teachers in South Bend; again, they easily could be adapted to any school's program.

We had originally expected to bring M.A.S.T.E.R. teachers together during the school day. Our principals initially advised us of a substitute shortage; we subsequently realized that each school system, and in some cases, each individual school within a system, had different time schedules. This necessitated our setting workshop times on weekends and after school.

We were advised this could affect attendance, but we need not have worried. The coldest weekend of the year--and the last shopping Saturday before Christmas--found teachers making worm farms, terrariums, and aquariums in a basement-level college workroom. They marched through the Zoo in spring rain and labored over mini-microscopes during summer vacation shine and gave up Saturdays and many evenings for science fairs and conferences. Yet at no time during the project did teachers lose their interest in learning more science and developing materials. Their voluntary and enthusiastic donation of hundreds of hours more than matched the dollar resources from Title II and the Commission for Higher Education.

The Project M.A.S.T.E.R. teachers--elementary school professionals well aware of the need to improve science education in the early grades--were both the subject and the object of this year-long activity. Their demonstration of the results of networking and shared effort is perhaps the best model to guide future planners in addressing the critical question of elementary school science teaching. Responding to the community support and administrative commitment, renewed through interaction with experts and with one another, they found that there are multiple ways to "Make Room for Science." Their names appear on a separate page, listed with their participating schools; they are the real authors of this resource guide.

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Community Education Roundtable

Project
M.A.S.T.E.R

Language Arts Approach to Teaching Science

On March 1, 1986, Project M.A.S.T.E.R. held a day-long conference at the Center for Continuing Education at the University of Notre Dame to focus on the exciting possibilities of integrating science into the K-3 elementary school classroom. The first of its kind in this area, it put our M.A.S.T.E.R. teachers in contact with higher education experts, consultants in arts, suppliers of educational science materials, and the Butzows, experts on curriculum design in math and science who together have pioneered the science/language arts approach. The working papers the Butzows developed for the M.A.S.T.E.R. conference are reproduced here; they provide both theory and practice. The Butzows' central theme, developed in classrooms and presented in national workshops, is that the skills required for reading--sorting, decoding, classifying, problem-solving, for example--are equally valid for developing the scientific method. Thus, reading books, often profusely illustrated, can offer an exciting resource for the integration of science and language arts. Using "classic" reading books, they offer ample demonstration of how that approach can and does work.

M.A.S.T.E.R. I

Science and the Language Arts Conference

March 1, 1986

General Session I

9:00 - 10:30

Science Through the Language Arts

Carol and John Butzow

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Childrens' Literature and the Elementary Science Curriculum

Few persons today would dispute that we are living in an age of science and technology. Yet the building blocks of knowledge which lead to understanding of these areas is given very little emphasis in the schools until students are well into their academic careers. While we do not expect elementary children to understand the intricacies of a technological society, we must provide them with an understanding and appreciation of science from the earliest years of their schooling. So often, science is poorly taught, or even ignored completely. By the time students reach junior high, science is rarely named as their favorite subject. Why is this so?

The answer may lie in such diverse causes as lack of administrative support, poor science curricula, and uninteresting and outdated text books to the teacher's anxiety that science must be based on the ability to read or that they simply do not feel prepared to teach it. Since a majority of teachers (K-3) are elementary education majors or generalists, science is not their forte as is the language arts area. Still, we feel that science must be taught as soon as youngsters enter the classroom. Pre-school is not too young but especially during the first three or four years of schooling, the child should be exposed to the scientific method.

We feel that the best way to teach science during the lower elementary years is not by using total hands-on activitives such as the obiquitous nature walk to gather leaves and press them. Nor is just a non-fiction text the answer. These books are often written beyond the level of the early reader and provide little means of identification with the child's world. Most importantly, they do not catch and maintain the child's interest, as there is no story line. Therefore, we suggest the use of children's literature.

Rationale for Using Children's Literature

Good children's literature books captivate the child's interest and information is rapidly absorbed from them

Teachers often feel most comfortable dealing with children's books and are used to reading them to groups

A fictional book with a scientific theme can be developed for both reading and language arts activities as well as to provide information and reenforcement

Other areas of the curriculum can be joined with science follow up activities and teachers who do not wish to take time away from reading and language arts skills need not worry. The subject areas will be integrated so that all aspects are covered

Limitations of Books to be used

Fictional books including poetry, folktales and concept books

Books with a suitable story line that children can follow

Grade levels K-3; also some pre-school non-text books are usable

Scientific themes or information must be an integral part of the story

Illustrated by various art media rather than photographs is usually preferable

How to select a book

Good works of fictional literature for young children need to tell a clear story that has a simple, continuous plot. The book needs to have an scientific theme that follows realistic and verifiable facts. The characters need to be well defined and convincing. Anthropomorphism needs to be carefully used. The story needs to be told with both dialogue and narration. The illustrations must be an integral part of the story. Illustrations need to be quality art and must fit the mood of the book. Most importantly, the content of the book must stimulate the children to want to know more about the topic.

Where To Find High Interest Books.

Where does the teacher find high interest books with scientific themes? Unfortunately, it is not an easy task, as there are few bibliographies which list fictional books under scientific entries. Until recently, the majority of books about science were nonfiction or dealt with the animal kingdom, often picturing these animals as mere extensions of human beings. These tips may help teachers in their quest.

Consult bibliographies such as A To Zoo by Carolyn Leina

Look in card catalog listings--be careful to ferret out only fictional entries

Get on mailing lists from book clubs, book stores, textbook publishers

Ask librarians in school, in the community, at the local college; find out how interlibrary loan works

Seek out children's literature specialists in your area or on your staff; or take a course yourself

Check winners of the Caldecott Medal and other book awards each yourself.

Take a glance at the surrounding books on a library shelf when you are looking for a specific volume

Be aware of certain authors who have written profusely on scientific themes: Leo Lionni, Eric Carle, Edna Miller, Aileen Fisher, Alvin Tresselt, Charlotte Zolotow, Robert McClosky, Edward Ardizzone, Bill Peek, Beatrix Potter, Byrd Baylor

Read book reviews in The Reading Teacher and School Library Journal.

Using "Whole Language"

After one or two readings of the book with the children one can begin the process of integrating the learning of science with that of reading. As the facilitator, the teacher might find it useful to subscribe to some, or all, of the tenets of the "whole language" approach to learing. By "whole language" we mean that children should learn to read for information, ideas, insights, and entertainment, all at the same time. Meaning is not to be found in isolated words, but in the entire context of the sentence, paragraph, or selection. We no longer segregate skills into separate little boxes but reach across subject areas to create a total learning experience. Just as children have learned to speak from interacting with the language heard around them, so too, do they learn to read by being placed in a literate, natural environment.

"Whole Language" and the Scientific Method

These two approaches can be closely compared--both use inductive reasoning so that words, stories, and situations are not constantly broken apart and analyzed; more attention is paid to the readiness skills children possess when they enter school; skills are not treated as though they lie in a hierarchy or continuum but rather as intertwined and entangled; neither subject is treated as a group of isolated facts or experiences; and the ultimate goal is to gain skills and information which will be meaningful in the child's life. This is part of the shift by many today in the methods utilized for beginning instruction of reading.

A Comparison of Whole Language and Traditional Teaching

Whole Language	Traditional Approach
Use of children's literature	Basal readers
Sustained silent reading	Phonics
Sustained writing	Worksheets
"Big Books"	Management programs
Free spelling for beginners	Penmanship/spelling as separate subjects
Study skills	
Editing of own writing	Reading as isolated class
Key word vocabulary	Basic word lists
Personal dictionary	
Predictive books	
Words in context	
Total meaning of print	

Learning to read and learning about science should both be natural processes for the child, i.e., done in a way that comes from within the child's frame of reference and without constant set limitations by adults. Children must be allowed to ask questions and predict, and given guidelines, but not answers. They must look for meaning in context and not be taught skills in isolation. Reading and speaking activities are constantly surrounding them so that they learn not from constant repetition and emulation of the adult but from their own processing of sounds, sights and phenomena. Children do not learn to speak by refraining from noisemaking until perfect syllables can be uttered any more than they can learn to read by ignoring the literary environment around them and studying thousands of flash cards and hundreds of rules.

Whole Language Activities

Reading and language arts methodology can be used across the curriculum to bring any or all subjects into a core of experiences. Some commonly used whole language activities would include:

Read to children daily

Make charts and graphs

Write poems, stories, journals,letters--all directed at a purpose

Write experience stories

Tape story dramatizations

Sequence pictures of a story and include original captions

Use various cloze procedures, especially descriptive words

Employ partner reading

Provide for sustained silent reading

Read books on similar topics or by same author

Edit stories in small groups

Use a question box for topic investigation

Retell stories to check comprehension

Provide for experiential activities

Use word processing and computer activities

Read books with predictable language patterns

Use choral or large group reading

Read "big books"--blown up versions of picture books

Teacher Creativity is Needed

True education comes from a behavioristic change, not just the ability to memorize. Therefore, we caution teachers to be creative as they use whole language with science and not to teach just facts. Stress experiences or activities which cause students to question, doubt, investigate, and invent. Learning must be alive. For example, gathering autumn leaves can be used as a project to categorize items in various ways, not just the time to go outside to pick up colored leaves which will be encased in waxed paper. Don't spend inordinate amounts of energy looking for books of someone else's experiments which may or may not fit your story perfectly. Use your intuition and freedom to find your own activities and themes.

Some books may have a host of themes, e.g. Robert McClosky's One Morning in Maine. It centers on Sal losing a tooth as she climbs the rocks near her Maine home. It can become a story about rock geology, tide pools, sea weed, or proper tooth care. Stimulate problem solving activities and branch off when you feel it necessary or when the students find another direction in which to go. It is not necessary to stick with just one aspect of your book.

With these ideas at hand, you should be able not only to introduce science into your curriculum, but to expand your reading/language arts program. This can result in an integration of subject matters which will have far more meaning to the world in which your students live. To show you the activities which might make up a unit of instruction, we offer four specific books and some suggestions for their implementation in your classroom.

The Carrot Seed describes the plight of a little boy who decides to plant carrot seeds despite warnings from his parents and his brother that they won't come up. He faithfully waters and tends them although the family repeatedly warns him that they will not grow. Eventually the carrot not only sprouts but must be carried away in a wheel barrow.

Science Activities

1. Put about 100 radish seeds into a piece of cloth. Tie the ends and put one end into a dish of water. Add water to the dish as necessary. After seven to nine days, open and observe. This approach is called the Rag Doll method.

2. Cut tops from carrots, parsnips, beets, radishes. Place in shallow dishes of water. Wait for them to take root.

3. Purchase several "peat moss pellets" and follow the directions to use them as a plant growth medium. Select fast germinating seeds such as radish, mustard, as well as common garden plants such as tomato, beans, peas, etc.

4. Germinate at least five bean seeds for each child in vermiculite/potting soil obtained from the grocery or hardware store. Use these little plants as an introduction to controlled experimental conditions. With your guidance, the children select and name the variables themselves. Have children measure their plants' height each day and also have them describe how each experimental bean looks. Different conditions of light, heat and water are good suggestions.

5. Germinate some peas, beans or lentils on "sandwiches" made of two pieces of clear plastic or glass sheet with a blotter between. Observe the changing "baby" plant as the seed germinates. As an alternative, line the walls of plastic tumblers with paper towels. Place the seeds between the plastic walls and the towel.

6. Grow plants from sweet potatoes or avocados. Support the sweet potato on tooth picks with its broad end down in a plastic dish of water. Leave in the dark at first. Avocado seeds should be washed in bleach, rinsed and dried and then suspend on toothpicks in water. Plant in soil when roots appear. Avocados will grow into beautiful "house plants".

7. Stuff some old white or light colored socks into others and tie with cord leaving about six feet of chord for a handle. Buddy teams of children should then drag the sock seed collectors through a vacant lot or "wild area". Many seeds will adhere to the outside of the seed collectors. Compare the ways the collected seeds disperse. You may also want to try growing "wild" seeds.

8. Select some seeds you will want to germinate for full fledged planting and growth to maturity. The "cherry tomato" is an excellent choice. Can tomatoes be grown in the classroom?

Language Arts Activities

1. Visit a grocery store and make a list of all the items children eat which are seeds.

2. Send for a class lot of seed catalogs. Practice reading the catalog. Photocopy the order blank at the end for each child to practice ordering seeds. Actually make a class order and plant the seeds when they arrive for transplanting outdoors as conditions permit.

3. Write a group of stories about how seeds disperse. Use observations from your sock collecting.

4. Have each child keep a sketch journal indicating the progress his or her seed makes each day. As new words about seed growth are learned add them to the page.

5. Gather samples of as many different kinds of dry seed foods as possible--popcorn, peas, beans nuts and other types. Have children glue a number of examples to posterboard and then describe the appearance of each seed-food in two or three words. Stress words that emphasize shape and texture.

6. Enlarge "The Carrot Seed" to an easel size "big book" to use for choral reading and word identification.

7. Have students retell the story to you or in small groups to check comprehension.

8. If you have basal readers, are there any plant stories in them? Let children of equal ability read as partners.

9. Have 8-10 pictures of a seed and how it grows until it becomes food for people. Cut these apart and have children practice putting them into sequence.

The Snowy Day tells how a little boy, Peter, wakes up one morning to discover that every thing is covered with fluffy, white snow. Outdoors, he makes snow angels and tracks in the snow, packs snowballs and slides down hills to experience the many different properties that snow has to offer. The book is a natural vehicle for a lesson on the snowy environment.
After you have read the book to your class, and looked at the superb pictures you are ready for a number of interesting activities

Science Activities

1. A glass of snow will melt into water in the classroom but will no longer be full. Have children observe how long it takes to melt snow in various parts of your classroom. Is snow water? What happens to melted snow when it is heated in the tea kettle? This is a great time to introduce the term "Water Cycle".

2. The tracks made by people or animals will be easier to study in the snow. You can play a great detective game with cards showing animal or bird tracks copied from a nature guide. Another fascinating alternative is for a group of children to make sets of their own tracks and then have a new group of observers guess what the track makers were doing while the tracks were made. Little amounts of bird seed can be left overnight to attract small friends to make convenient tracks for further investigation.

3. The pattern of light and shadow on the snowy school yard shows how light becomes heat to melt snow and warm people. This is a stimulating way to combine an art project with a beginning mapping experience. Thermometers can be used around the school yard to check predictions from your shadow maps.

4. Wind also moves snow around the school yard. Observe the little dunes made by the wind. How do fences, walls and other standing objects affect the snow cover?

5. Sun turns snow to water and back to ice along roof lines, fence tops and other exposed areas. Look for icicles and investigate if they are produced on the same side of buildings, etc.

6. When snow is falling break out the black construction paper and magnifying glasses. Look at the many patterns produced by snow flakes. Are there patterns to them?

7. Challenge the children to find the places where the amount is greatest and smallest. Measure the snow depth at these key places before and after snowfalls. Have children guess the reasons for the depths they find.

8. Are the children learning the computer language, Logo? Try drawing snowflakes.

Language Arts Activities

1. Read and write poems about snow and snowy places.

2. Make a word search containing the "Water Cycle" terms: water, ice, vapor, steam, solid, liquid, gas.

3. Have children tape record their own stories about times when the snow helped them have a great time.

4. Read the section of On the Banks of Plum Creek by Laura Ingalls Wilder when "Pa" became lost in the snow on the way home from town and survived by eating the Christmas candy. Have the children write their own stories about how snow changes their lives.

5. Collect magazine or calendar pictures of snow scenes for which the children write captions.

6. Take a snowy day walk and have children dictate all the words they can think of that describe the texture of snow. Use these words to guide them as they make texture sculptures by gluing fine and coarse materials on paper. Exchange and describe the textures while blindfolded.

7. Use Hans Christian Anderson's timeless folk story, "The Snow Queen", as a scenario for a video play planned and acted by your class with costumes and sets of their own design.

8. Make a chart or graph of how much snow falls each day in one certain place for one month.

Spectacles by Ellen Raskin introduces students to the world of lenses. It could also be used as a unit for proper eye care, going to the eye doctor, having an eye exam, or learning about the world of blind persons. In this book, Iris sees things around her house in most peculiar ways--she thinks a kitten on the couch is a bulldog, children lined up in class resemble a caterpillar, Aunt Fanny appears to be a dragon, and even the optometrist becomes a blue elephant. After the exam and a visit to the optician to be fitted for glasses, Iris sees the world as it should be.

Science Activities

1. Use a drop of water placed on a small piece of waxed paper to magnify items on a table.

2. Mix a packet of unflavored gelatin and let it set up in a tightly closed plastic sandwich bag; the clear gelatin will magnify and change shape as the lens in the human eye does.

3. Get a set of eye glass lenses and experiment with them. Are they are the same, or do they do different things? Are all eye glasses made with the same kinds of lenses?

4. For "3D" effects use old viewmasters or stereoscopes.

5. Organize eye exams for your class.

6. Go on a field trip to the optometrist and/or optician--this is best done on the office day off when an assistant can conduct the tour.

7. Make a cut out section about 8in. x 8in. in a paper bag in front of the students' eyes; cover this with waxed paper, plastic wrap, colored celophane, or theater gel to show them how other animals' perception of the world is different.

8. Use a plastic model eye ball to explain the parts of the eye and their functions.

9. Compare the eye model to a camera, especially if you can take apart an old one to show its parts. Allow the class to take a few snapshots and have them developed for the bulletin board.

10. Use fresnel lenses, magnifying glasses or magnification boxes to look at items around the classroom or outside. Insects, small plants, and soil can be especially interesting.

11. Have a person who wears contact lenses explain the difference from regular glasses.

12. A grandparent or older person who has had cataracts removed might explain how this is done; children can make up interview questions.

13. Make rainbows by shining light beams through bottles of water or prisms; learn the colors of the spectrum; how are rainbows produced?

Language Arts Activities

1. Learn the difference between optometrist, optician and opthamologist by doing a little play of a child going for an eye exam--costumes and props are very important!

2. Using the official eye chart, see how many words can be made up from the letters; think of a word starting with each of the letters

3. Make up an eye chart for younger children using little pictures as means of word identification.

4. Make a word search of "eye terms"--use them for spelling or handwriting; put them in student's key word dictionary.

5. Have children sit thorugh a language class blindfolded; discuss reactions. Put feelings on the board or a chart, using whole sentences, e.g.,"I was frightened." or "I could not keep track of the story

6. Spend some time manuvering with blindfolds and a stick or cane; do a personal language experience story about it.

7. Write poems of haiku about being able to see the world; the teacher should read poems which are intense in their visual imagery.

8. If the students go on a field trip to the eye doctor, have them retell the facts of the visit as a comprehension check.

9. Find pictures of famous Americans who wore glasses: George Washington, Paul Revere, Ben. Franklin, Thomas Edison, Harry Truman, etc. Make a duplicated booklet about their accomplishments.

10. Make a mystery box. Place in it an unknown item that will make a distinctive sound when the box is manipulated, e.g. a pine cone. Each child shakes the box. Record the observations or guesses made about the identity of the object. Stress recording of details.

Health Activities

1. Discuss good eye care and list examples such as use of protective measures in sports, playground safety, avoidance of dangerous toys and pointed objects.

Community Activities

1. Find out about services to the blind such as seeing eye dogs, talking books, home delivered meals.

Art Activities

1. Design eye glass frames for each child to wear--make then humorous, intelligent, etc.

2. Show students pictures which use dimension; have them do simple drawings using it.

3. Make three dimensional objects, e.g., card board castles from toilet paper rolls, empty tissue boxes, cereal cartons, etc.

Physical Education

1. Using the paper bags with cut out viewing areas, play tag or have a scavenger hunt. This shows how persons or animals get around in a world differently perceived from ours.

Music Activities

1. After studying about rainbows, learn some rainbow songs--"Over the Rainbow" by Harold Arlen from "The Wizard of Oz", "The Rainbow Connection" from "Sesame Street", and "Look to the Rainbow" by Burton Lane from "Finian's Rainbow."

How Big is a Foot by Rolf Myller, is the story of the invention of measurement standards and the teaching of estimation based on them. The King wishes to have a bed made for the queen's birthday, as she has everything else in the world and beds haven't been invented. Walking around the prone queen, he estimates a bed three feet by six feet would be perfect. The apprentice's finished product is much too small until he realizes his feet are not as large as the King's. Using a mold of the King's foot as a standard of measurement, everything works out well and a new bed is constructed.

Science Activities

1. Using a soda straw, make the child's foot his/her own standard of measure and cut the straw to that length; measure common items--pencil, table top, book, etc.

2. Using the index finger as another unit of measurement (an primary school child's index finger is about one centimeter across) look at things as so many fingers wide or long. Try a great deal of estimating and checking of estimates by measuring.

3. Draw around the feet of all the members of your family and measure them in fingers. Put them in order from largest to smallest.

4. Borrow a shoe store metal measure and check everyone's shoe size. Rank order them from largest to smallest.

5. Have children bring in a copy of their footprint as a baby. Compare the size of their footprints to those of Cabbage Patch dolls and other dolls and stuffed animals.

6. Have children lie on a large piece of paper and trace their outline. Measure them in "fingers" or "feet" using the soda straw measures.

7. Have a series of objects which will fit inside each other. The class guesses in which order they will fit, but cannot touch anything. They may measure with their soda straws before seeing if their guess is correct.

8. Using teams of children, find objects the same length as their soda straws. This is done well outside or on a nature trail.

9. Have the children measure their beds at home. Are they 3ft. by 6 ft.? Measure other sized beds in the house. Are they smaller or larger than 3 ft. by 6 ft.?

10. Bring in a favorite doll or stuffed animal. Using the soda straw, measure how big a bed it would need. Make one from a cardboard box.

11. Identify footprints of animals from drawings, charts, or field guides. During the winter, go out and look for tracks in the snow or soft soil. Measure the distance between repeated tracks. Decide whether the animal was walking, running, hopping, etc.

12. Lead into the measurement of temperature, time or other quantities using appropriate books to sustain interest--e.g., The Grouchy Ladybug by Eric Carle for time concepts.

Language Activities

1. Select a King or other person whose foot can be the standard of measurement.

2. Talk with Mom or Dad and write a language experience story called "When I Had Very Small Footprints."

3. When reading the book, stop after the apprentice goes to jail and see if the children can predict the ending; write down the predictions and check them later.

4. Check the basal reader, if one is used, for other stories and/or exercises used to develop predictive skills.

5. Make up field perception exercises in which the one different word of a line is circled, for example:

foot foot feet foot
feet foot foot foot
foot feet foot foot

Continue with similar pairs--back/body, hand/head, etc.

6. Read other fables or folktales which give mythical answers to scientific questions, e.g. How the Sea Became Salt

7. Have children make up stories for the invention of other units; e.g.: liquid measure equals how much the King drank in one day; distance is how far the King went on his daily stroll; time is the length of the King's dinner, etc. Write these down as stories; they could be used for writing samples or illustrated as little posters.

8. Partner reading.

10. Write a TV script of the story; act it out with several groups to compare interpretations.

Art Activities

1. Make paper bag puppets to use putting on the play children have written.

2. Let the children walk bare foot in brightly colored water based paint and make a large wall mural.

3. Make abstract art pictures in which all lines are the length of their soda straw. Shapes and colors may vary.

4. If it is allowed and the school has a mascot, paint big foot prints of the animal on the sidewalk from the exit door to the bus area, the playground, or the fire drill safety spots.

5. Using a measure determined from the length of a soda straw, make a templet and cut squares of various colored paper or fabric. These can be glued together as a type of collage or sewn into small quilts for dolls.

Music Activities

1. Learn some songs which speak of measurement, e.g.: "A Bushel and a Peck" by Frank Loesser (from Guys and Dolls), "Inch by Inch, Row by Row" by Dave Mallet as sung by John Denver. Also check the school music book series for other examples.

2. Fill bottles with different measures of water to show how various pitches are produced when they are tapped or blown across.

3. Look up books on making musical instruments which demonstrate how the length of the vibrating body produces different pitches. Check the Music Educators Journal Feb. 1980, vol. 66 No. 6, "Making Simple Instruments for Children," by Dallas Cline.

Physical Education

1. Have relay races which concentrate on using the feet: hopping, jumping, skipping, three-legged races, etc. This is particularly exciting if children put on dress up clothes before going to their goal, then pass them on to the next person in line.

2. Run traditional races and events such as the broad jump; estimate the distances and verify with soda straw measures.

Summary

We hope children will no longer see science or any subject as the mere acquisition of facts to be regurgitated at the proper time. Children's interest is highest when they enter school. If we can capture it at that point with interesting, exploratory methods of doing things and nuture it throughout the elementary years, we should have a new generation of students who will not be alienated from science. They will be scientifically and technologically aware of their surroundings as no previous generation has been. They are our children and we have accepted a challenge to teach them to be thinking adults. Our approach was designed to help you implement these goals.

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Revised 2/8/86 JWB-CMB

Burt Dow
Deep Waterman

Burt Dow, Deep Waterman, according to its author, Robert McCloskey, is a tale of the sea in the classic tradition. In the old sea stories, a single individual, often alone, becomes ship wrecked far from shore but finally through most unusual circumstances arrives home safe and sound. So it is with Burt Dow. Old Burt is a deep waterman, a merchant seaman, retired now to the Maine coast where he does odd jobs, paints for the local physician and occassionally fishes from his double ender the Tidely-Idley. His old boat is powered by an antique "make and break engine", one of a disappearing group that can run either direction.

It all starts one morning when Burt is awakened by Leela, his sister, and gathers his gear for a day's fishing. As he fishes, Burt accidentally catches his hook on the tail of a whale. The whale is cooperative and Burt cuts the hook loose. A storm comes up. Burt and his little vessel are tossed about until Burt wonders if they can survive much longer. For refuge Burt sails right into the inside of the whale. Finally after the storm is over, Burt and the Tidely-Idley sail out of the whale and meet the whole pod of whales before heading home.

Using Burt Dow

Reading and Language Arts

Read Burt Dow in two sections, stopping once he is stuck in the whale.

Day 1 Prediction--how will Burt Dow get out of the whale?

Day 2 Cause/effect--irritated stomach lining/burp.

Have the children write in a journal every day. This can be on any topic, but encourage them to make reference to their Burt Dow activities.

Poems and free verse about the sea, boats, sailing, animals, etc., can be written--share them or keep them in journals.

If you are artistic, sketch some scenes form the book on sparate cards. Have the children put them in proper time sequence and make captions for them. Or just write short phrases describing events, mix them up and sequence them. Time them to make it a game.

Have the children write a story from the point of view of the whale. How did he feel throughout all of this?

Have children tape record stores which begin:

If I were caught in the belly of a whale---

If my make and break engine stopped---

If I were a retired fisherman---

Type these into books which can be decorated and kept.

If your class is reticent to talk, try wordless books on similar stories, for example, Noah's Ark by Peter Spier.

Play charades from incidents in the book--waking someone up, being lost in the dark, etc., or ones suggested by the book--painting a room in many bright colors.

Locate the seven seas, using a globe. Where did Burt Dow sail when he was a deep waterman?

Have children write a note in a bottle about themselves (both facts and opinions) and "send the off" to others in the class. Guess who the person is from the descriptions.

Write the the Rhode Island Marine Advisory Service for identification posters of whales.

Rhode Island Marine Advisory Service
University of Rhode Island
Naraganestt, RI 02882
Telephone 401/792-6211

The best source of whale information in a single volume for teacher reference is:

> A Field Guide to the Whales and Seals of the Gulf of Maine, by Steve Katona and David Richardson.
>
> Order it from:
>
> Allied Whale, College of the Atlantic, Bar Harbor, Maine 04609

Have each child be a sea animal and tell about it. Then put facts on index cards and tape to others backs. Can each child figure out who they are by asking questions? Am I an animal? Do I need air? Am I a filter feeder? Do I bear my young alive?

Be penpals with a school in a coastal fishing village. Exchange photos, postcards, information on schools, the community, etc. You might make contact through the membership of the National Marine Education Association. Write to:

National Marine Education Association
Box 666
Naragansett, RI 02882

Write a letter to Burt Dow inviting him to visit you. Tell him some interesting things about your school and town so he will be anxious to come.

Learn about the author, Robert McCloskey, and the other books he has written. What awards has he won for them? Are some similar to Burt Dow? Write and tell him if you enjoyed his work:

Robert McCloskey
Cape Rosier, Maine

Let each student have a milk carton mailbox. Match students and have them drop off notes or questions about the day's work in each other's box. Give them a few minutes each day to discuss these. The teacher can also put individual messages into the boxes.

Have a question box for questions about the ocean--e.g.: why is the sea salty? Will oceans be filled up, etc. Open this periodically and answers if other students don't have an explanation.

Find a guest speaker who can talk about Maine, whales, the ocean or related topic. A slide presentation would be a fine addition.

Compare and contrast inland and ocean fishing. A speaker, books, or magazines would be source material.

Using the book Burt Dow, Deep Waterman, page 3

Find short stories about the sea and read them to the children. These should be both fiction and non-fiction, and they can be used to check listening skills and comprehension.

select other sea related books for sustained silent reading. Some examples are:

The "Tim" books--Edward Ardizzone

The Grouchy Ladybug--Eric Carle

Swimmy--Leo Lionni

The Beach Before Breakfast--Maxine Kumin

Fish is Fish--Leo Lionni

Wharf Rat--Misha Miles

Hide and Seek Fog--Alvin Tresselt

Rain Drop Splash--Alvin Tresselt

The Wreck of the Zephyr--Chris Van Allsburg

Employ partner reading--from their books, from their song lyrics, from stories they write, etc.

Find some posters or large pictures of the Maine coast. Have the children write descriptions of these or tell their feelings or find adjectives to express themselves. You might write to:

State of Maine Publicity Bureau
929 Gateway Circle
Portland, Maine 04102

Discuss literal and figurative language and idioms--e.g.: Burt's sister is always saying "hit the deck". What idioms are used at your home? Examples might include "up and at 'em", or,"rise and shine", or "last one in is a rotten egg," or "hit the sack."

Study pictures of light houses, waves, tides and write short descriptions or anecdotes about them.

Learn the basic sea shells of the Atlantic, the Pacific or Gulf coast. Even inland, you might learn the freshwater mussels or snails in your area. Some inland regions abound in fossil shells. Describe the shells in a sentence, which can be hung on the wall.

Using the book Burt Dow, Deep Waterman, page 4

Blindfold students--have them touch and smell various items from the sea--shells, fish, clams, etc.--whatever you can obtain in your area or get from friends. Use descriptive words. Even a thesaurus could be employed by the teacher.

Learn the parts of a boat--port, starboard, etc. Bring in a canoe or light boat and keep it in the classroom. Put the names on the boat with masking tape. If the school has a swimming pool, a canoe may be available there.

Make "word finds" and "crossword puzzles" or play any kind of word game using nautical terms found in the book--e.g.: rigging, tiller, gale, deck. Don't just make a list of spelling words or vocabulary words to be memorized. Use them in context.

Use cloze procedures--either verbal or written for the first descriptive section of the book.

Field trips and follow up

Visit a maritime museum or the section of a general museum dealing with the sea, if one is nearby. Some museums send out traveling exhibits or slide presentations on specific subjects such as whales or commercial fishing.

Visit the fish department of the local grocery store; take some recipes home.

Cook an unusual sea item for the class to try, eg.: sea weed rolls make like cabbage rolls. Many of the recipes for this kind of cooking can be found in oriental cookbooks.

Study a seafood menu and see how many items you recognize. Can you find magazine pictures of all of the items and label them on a poster?

If there is a "Long John Silver" or other seafood restaurant nearby, go for a tour and see how fish is prepared.

Write some language experience stories about any of the activities the class is doing--e.g.: the trip to the store. Have children edit each others work. If you have a computer in your classroom, put the stories onto a word processor such as Bank Street Writer.

Art

Using the book Burt Dow, Deep Waterman, page 5

Bring in leftover paint from home and make a scale model mural of Burt's boat, the Tidely-Idley.

Design a colorful lobster buoy of your own.

Make cardboard or heavy paper dories and peapods.

Look at pictures of how various boats are rigged, eg.: A History of American Marine Painting, by John Wilnerding (Peabody Museum in Salem, Mass., 1968).

Decorate the room with black silouettes of various kinds of boats from hand rowed ones through sailing ships and submarines.

Design a bumper sticker to save an endangered species. It should also have a slogan on it. Make sure the children understand what endangered species means, but that is doesn't apply to every animal.

Make mobiles from sea related pictures, shells or other maritime materials. Shells can be turned into numerous projects.

Make a sand table sea fishing village as is shown in Burt Dow.

Music

Many, many sea and sailing songs have been recorded for children to hear. Especially try to find authentic, non-commercialized ones. Each child could have his or her "poems" (song lyrics) to make into a poster and decorate with nautical pictures.

Learn some sea chanteys--the work songs of the sea. Have a group do the refrain then a leader or small group can add verses. Improvise new verses once they know the songs and are familiar with the process.

Science

Have the children line up on the playground in the shape of a whale. Be sure you have the true to size measurements for various types of whales.

How do whales and sea animals see, hear, feel? Do they communicate? (You can get whale records from National Geographic)

Using the book Burt Dow, Deep Waterman, page 6

Plant geraniums and peas for both beautification and as a scientific activity. You might grow your sprouted seeds in differing conditions of light, water, soil, etc.

Bring in some wash basins like the ones used to wash dishes. Four or five for your class would do. Work with the idea of what makes things float or sink.

> Test common items to see which ones float and sink. Keep a log of the materials that make up the objects.
>
> Give out equal amounts of plasticine and see who can make a boat to hold the greatest number of paper clips.
>
> Will all boats sink when filled with water? Make some of differing materials to see.

Learn about wind and waves by blowing on a floating object--windward side gets force, leeward side is protected.

Make or bring in items which can be blown by the wind (beanie hats, tinker toy towers, erector sets). Take them outside on days of varying wind conditions to see how they react. Make notations in your log about wind direction and strength. Which is the Burt Dow day-the day of heaviest wind?

Waves can be demonstrated using the overhead projector. Put 1/2 to 1 inch of water into a glass baking dish which is placed on the overhead . Use eye droppers to add drops of water which create waves and ripples. Watch them project on the wall.

Listen to weather radio and become familiar with terms they use--e.g.: small craft warnings.

Social Studies

Have a weather station in the room with someone in charge each day to record the weather. Various wheels with pointers on them (like a clock face) could show inside temperature, outside temperature, cloud condition, precipitation.

Gather pictures of various clouds and put them in a sequence from fair to stormy weather

Invite retired people like Burt to visit your class and talk about their youth and work. If you are in a non-coastal area, pick someone whose job is typical of your area--in Pennsylvania, a coal miner, an Idaho potato farmer, etc. How was their childhood different from your childhood, eg.: no TV! Also many veterans have stories of the sea which can be told to children.

Using the book Burt Dow, Deep Waterman, page 7

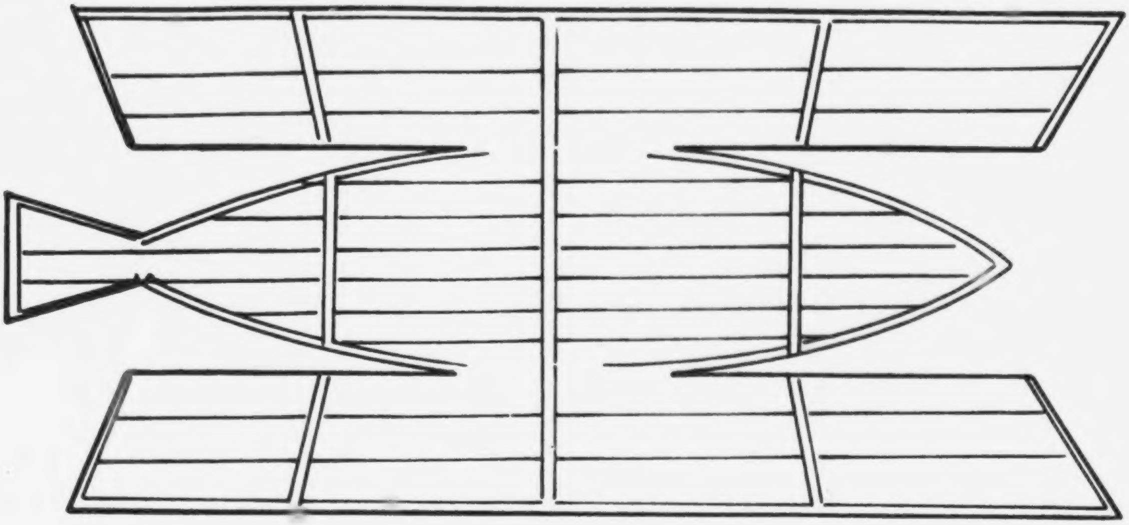
Figure out about how old Burt would be and make a time line of that length. Mark major events of the world on it. How was Burt's life different as a child?

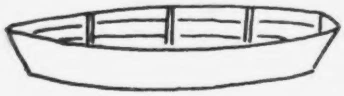
Example procedures are attached if you want to make lobster buoys or paper model boats.

Revised 2/9/86 CMB-JWB

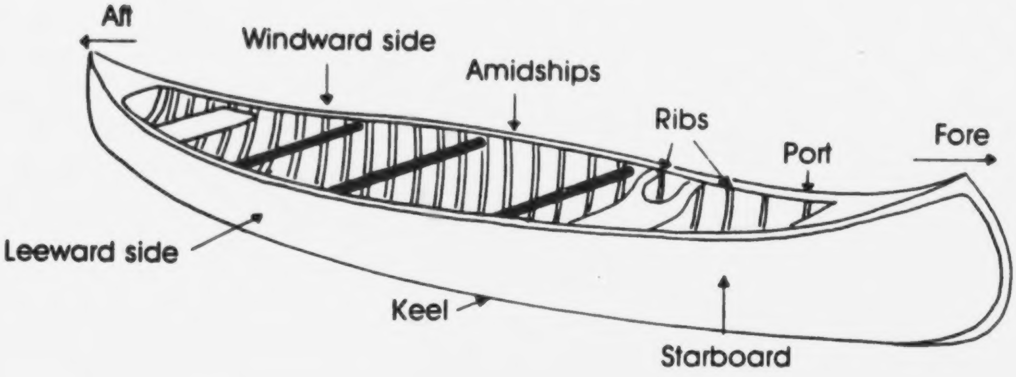
Using the book Burt Dow, Deep Waterman, page 8

Making a Dory Model





Canoe Parts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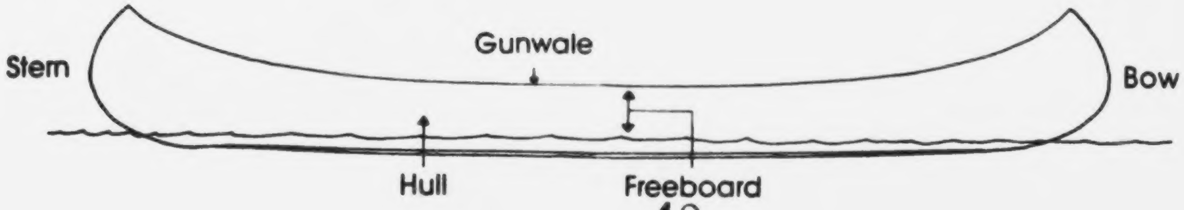
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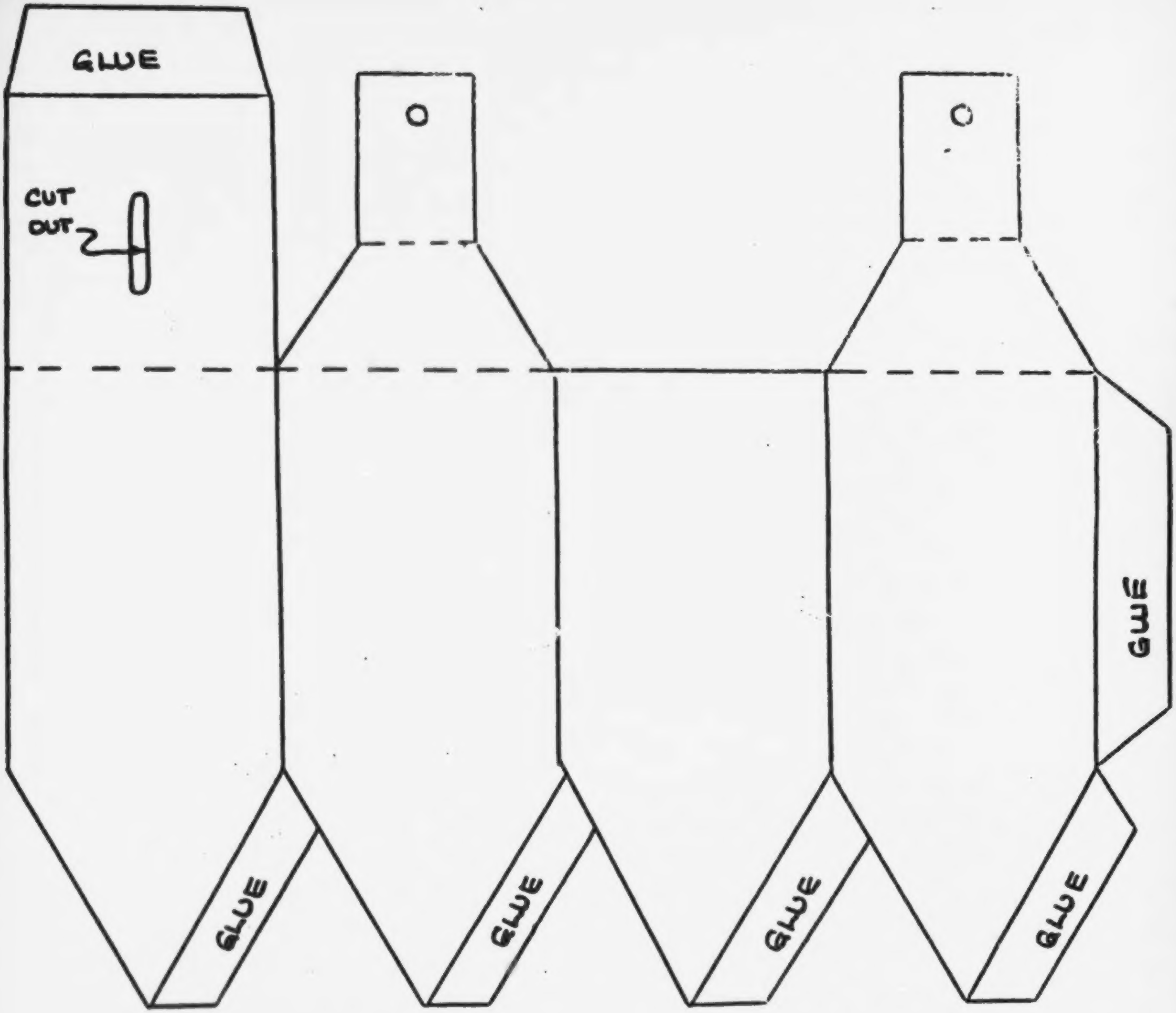
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TEMPLATE FOR PAPER LOBSTER BUOY

M.A.S.T.E.R. I

Science and the Language Arts Conference

March 1, 1986

General Session II

3:15 - 4:30

Concept Mapping and the Integration of Curriculum

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Concept Mapping and the Integration of Curriculum

Science and Concept Learning

We have been advocating the integrating of fictional children and science instruction in this conference. These two ideas are, for many people, like mixing water and oil. Children's literature provides many teachers a source of enrichment for the curriculum. Science, on the other, hand is serious business with all those specialized vocabulary words to be learned. Science also evokes the idea of a structured curriculum that demands a high degree of organization from unit to unit and grade level to grade level.

In our earlier presentation, we showed that science can be taught through children's literature. We have left until now the question of how to deal with problems of organizing integrated science-language arts lessons into a curriculum. Most of the research done on science learning of elementary school children points to problems of over expectation if teachers and curriculum developers expect children to learn a highly structured set of abstract ideas. Researchers have shown that in the development of science concepts each child integrates knowledge in his or her own way. Dr. Ronald Raven of the University of Buffalo, for example, studied the child's concept of motion in detail. He found that children tended to develop the basic general ideas first, and later ,if ever, learned to integrate the finer parts of the relationship. In the specific conceptual area of force and motion, children easily learned by example that a heavy, large car will cause more damage in an accident than a small, light car when both are traveling at the same speed. This broad general concept was often learned by age 7 or 8. The fine detail about size of force and the rest of the specialized knowledge could only be learned when the children reached junior high school or later.

While many textbook writers have seduced curriculum committees with the notion that a tight structure is important to guarantee the success of a school science program, there is little evidence to suggest that there is any one good topical hierarchy. Further, there is no evidence to suggest that there is any real advantage in attempting to link topics together in any special sequence. There is abundant evidence, however, that points to working from concrete examples and the every day experience to unite newly formed ideas into a reality available to children.

In the past we have insisted that each child learn to recognize words and definitions of a specific set of science words as evidence of mastery of content learning. Novak and his coworkers, have shown that it is more important for each child to be able to trace relationships between the concept words she or he knows and real life examples. Our synthesis of this research on concept learning in elementary science leads to the following conclusions:

1. While content can be structured into basic blocks of supporting ideas it is the linkage between ideas and real experience that is more important than definitions of the ideas themselves.

2. It is not the choice of topics in any given hierarchical order that makes a good science curriculum, but rather the richness of the concrete stimuli that helps teach specific basic ideas.

We have observed that many teachers who begin to use children's literature and concrete learning experiences no longer feel they can teach the whole science text they are assigned. The concentration on concrete reality simply takes much more time than reading in class with an occasional activity selected from the teacher's guide. This is so and teachers should not to worry that some topics will be omitted from the curriculum. Preferably the curriculum committee should select three or four major topics per grade and give you the freedom to develop those topics in detail.

How to Plan with your Science Text

We do not advocate complete abandonment of science texts if up to date ones are available to you. We do suggest, however, that you limit your coverage each year to several important topics which you examine in detail. Our bias is that you integrate fictional children's literature into your plans as you do this.

We have centered the rest of this presentation around the topic of force and motion. We have selected to use the 1986 edition of Scott, Foresman Science (Grade Two) as our text. Our children's literature example will be the classic by Virginia Lee Burton, Mike Mulligan and his Steam Shovel. The first question we need to ask ourselves is how do we find out what major ideas or concepts the text book or fictional book provides us. We will unravel this content using a tool known as concept mapping. This idea was introduced several years ago by Dr. Joseph Novak of Cornell University and is described in detail in Learning How to Learn, (Novak and Gowin, 1984). In Learning How to Learn, Novak and Gowin describe concept mapping as follows:

> Concept maps work to make clear to both students and teachers the small number of key ideas they must focus on for any specific learning task. A map can also provide a kind of visual road map showing some of the pathways we may take to connect meanings of concepts in propositions. After a learning task has been completed, concept maps provide a schematic summary of what has been learned.

Concept maps are simple visual devices that allow us to relate the major ideas. You can make a concept map of a set of learning materials from a text, a fictional book, or from your head or from any source. The directions are simple to follow:

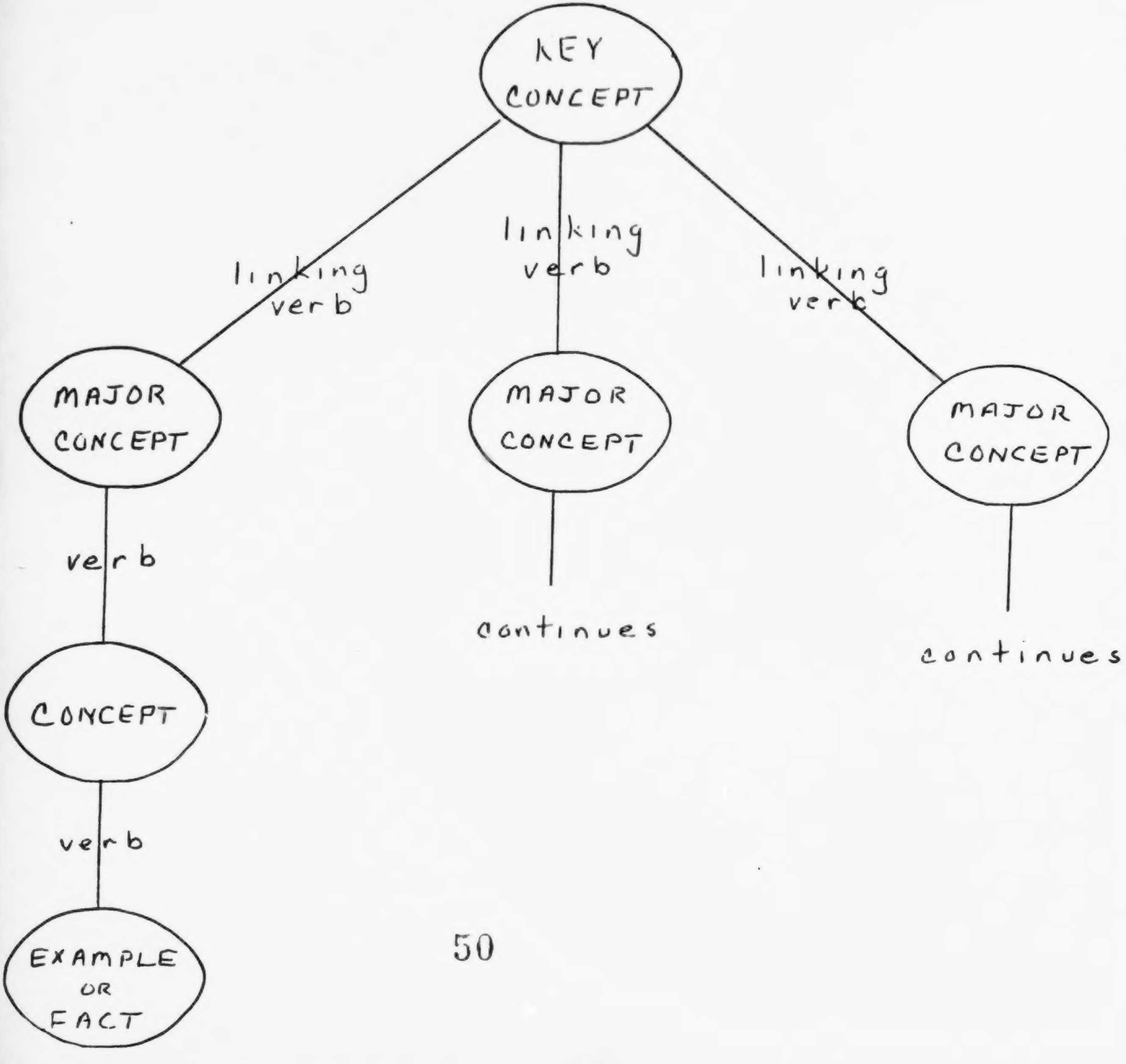
1. Draw a oval around to each major concept or idea.

2. Work down from big ideas to lesser ones to specific facts or examples.

3. Connect all closely related concepts together with lines and write connecting verbs on the lines to show relationships.

Our first figure will provide you with a "generic" concept map to demonstrate the rules.

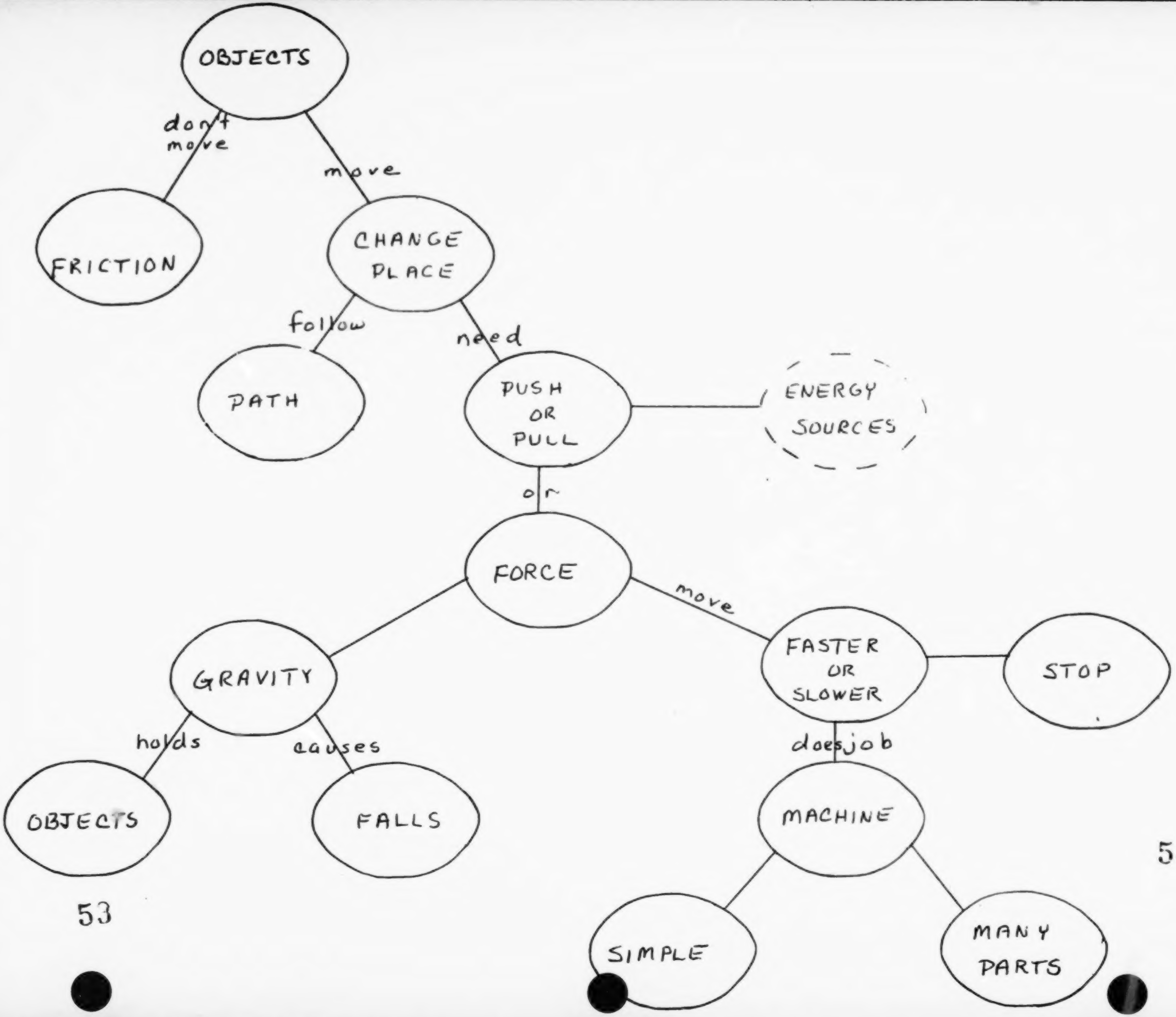
Figure 1. A generic concept map.


KEY CONCEPT
linking verb
linking verb
linking verb
MAJOR CONCEPT
MAJOR CONCEPT
MAJOR CONCEPT
verb
continues
continues
CONCEPT
verb
EXAMPLE OR FACT

Mapping the Text

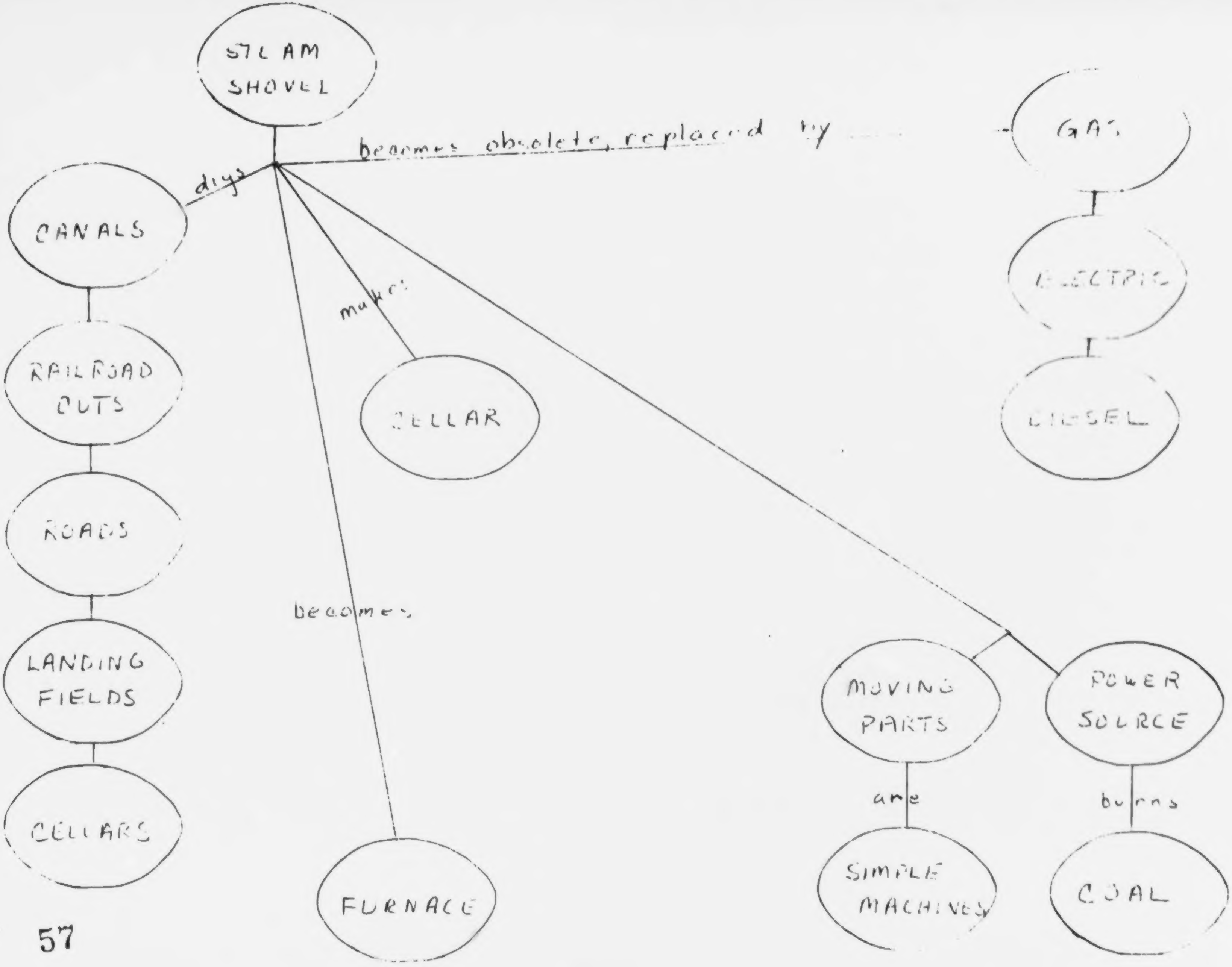
The Scott, Foresman second grade text, Unit Five (Motion), provides two chapters that show the relationships been movement and forces. Chapter 9 helps the child focus on the need for change in position to detect motion and introduces the idea of sticking (friction) as holding back motion. As we move to Chapter 10, the term force is introduced as a requirement for motion to occur and machines are showm as being helpful in moving objects faster or with more ease. We have concept mapped the contents of this unit to help you see how easy it is to do this.

Figure 2. A force-motion concept map from a second grade text


OBJECTS
don't move
move
FRICTION
CHANGE PLACE
follow
need
PATH
PUSH OR PULL
ENERGY SOURCES
or
FORCE
move
GRAVITY
FASTER OR SLOWER
STOP
holds
causes
does job
OBJECTS
FALLS
MACHINE
SIMPLE
MANY PARTS

Our next task is to make a concept map of the book Mike Mulligan and His Steam Shovel. We will first go through the book to show you the rich detail it contains. Then we will pause to make individual concept maps. Only then should you look at the map we have completed. One of the things you will notice as you turn over the next page is that our concept map probably differs from yours. This is not unusual. In order to make a concept map, a person needs to seek out relationships among the ideas he or she personally discovers. Each of us will see slightly different relationships and hence will arrange our ideas visually--on the map in different ways. No one map is best. You can judge your self in concept mapping ability largely on how many relationships you find. Better map makers will show a richer network of relationships.

Figure 3. A concept map of the children's book, Mike Mulligan and His Steam Shovel.


STEAM SHOVEL
becomes obsolete, replaced by
GAS
ELECTRIC
DIESEL
digs
CANALS
RAILROAD CUTS
ROADS
LANDING FIELDS
CELLARS
makes
CELLAR
becomes
FURNACE
MOVING PARTS
are
SIMPLE MACHINES
POWER SOURCE
burns
COAL

Mike Mulligan is an excellent book because it gives a fine network of ideas to develop an intermeshing of the science text and fictional book. They contain complementary ideas. The science text points out technical definitions of a few important words, while the fiction book gives us a story line to connect the idea of force moving objects with digging canals, road beds and finally the cellar of the new Popperville Town Hall. The end papers of the book even help us detect the parts of the simple machines and energy converter that is that wonderful Mary Anne--the steam shovel with A+ in personality.

Below, we have included a description of some ideas you might use if you select this book as the basis of your second grade force and motion unit.

A Synopsis of Mike Mulligan as an Instructional Unit.

Mile Mulligan and His Steam Shovel describes the artistry of Mike and his fabulous steam shovel, Mary Anne, as they dig canals, railroad cuts and right of ways for great highways. Then, as progress overtakes the age of steam, Mike and Mary Anne look for one last adventure. They stumble onto Popperville and get the job of digging the foundation for the proposed town hall. Not being able to get out of the newly dug cellar immortalizes Mary Anne as she becomes the new heating plant with Mike as her engineer. This simple classic offers many opportunities to inquire into how things are moved and other energy related topics.

Science Activities

1. What machines have made your life easier than your parents or grandparents? Do today's machines all use the same forms of energy? Which energy sources are cheapest or most available in your area? Are appliances considered to be machines?

2. Enlarge the picture of Mary Anne in the end papers of the book. Use the part names to encourage children to learn about levers and pulleys. Have children make other poster size diagrams of important machines such as trucks, cranes, bulldozers, cherry pickers, etc. Do they have tonka toys at home which could be used for demonstration purposes?

3. Use pulleys and boards to experiment with moving heavy objects. Have contests to see how creative children can be by giving prizes for the person who can figure out a way to life twice her weight, etc.

4. Visit a museum which features antique and modern machinery. Ask for special emphasis to be placed on steam powered machinery.

5. Make machines out of erector sets, tinker toys, Legos and other building materials. After the construction is done, talk about how the input force is multiplied by the machine.

6. What form of energy heats (or cools) your school building. Visit the heating plant. Find out how much it costs a year to heat the school. What is this per month, per week, day, etc.

7. What are the simple machines we use in our homes? Bring in and use examples such as a cork screw, pliers, or screw driver.

Language Arts Activities

1. Look in magazines and books for antique machinery. Write descriptions of how the machines got their energy.

2. Compare the way a machine like Mary Anne grows old with stories of how people grow old. Are there similarities or differences in the stories?

3. Learn how to make diagrammatic drawings. Practice labeling them using a few, well selected words.

4. Visit a hardware store during sale time. Use the sale flier in combination with personal observations to describe the machines found there -- hand lawnmowers, wood splitting wedges, etc.

5. Why do we need machines? This topic can be discussed with the help of parents who work in the industries of today. Have children write questions for a question box in preparation for the class visit. Tape record as the class interviews the parent and then write brief stories in "news paper" format.

6. Select other books about machines from your school or local public library for sustained silent reading.

7. Make a working posterboard cut-away model of Mary Anne. Have different groups of children write a set of directions on the operation of the model. Have different groups try out each others directions while the class watches.

8. Read other books by the same author (such as "The Little House") and see if she uses a similar theme.

Showing off your Activities

If you wish, you can visually describe your unit in a diagram called a web. The Web uses the key concept from the concept map and arranges around it selected modes of learning such as field trips, writing, making, interviewing, additional reading or any set of appropriate ways of experiential learning. A web makes it possible to learn science (or any other content area) and a wide variety of language based skills. The web focuses on the basic unity of your instructional unit, and helps you recognize that you are teaching one basic idea or concept using a wide variety of means, so that your class will be able to apply what they learn to the broad context of life. The use of web based teaching including some marine science concepts is described in the January 1986 issue of the Reading Teacher, by Philllis Brazee and Janice Kristo.

Our next two figures are intended to help you design webs for your own use. Our first one is a general or blue print for other webs. The second is a web for Mike Mulligan.

Figure 4. A generic web for the design of integrated units of instruction.

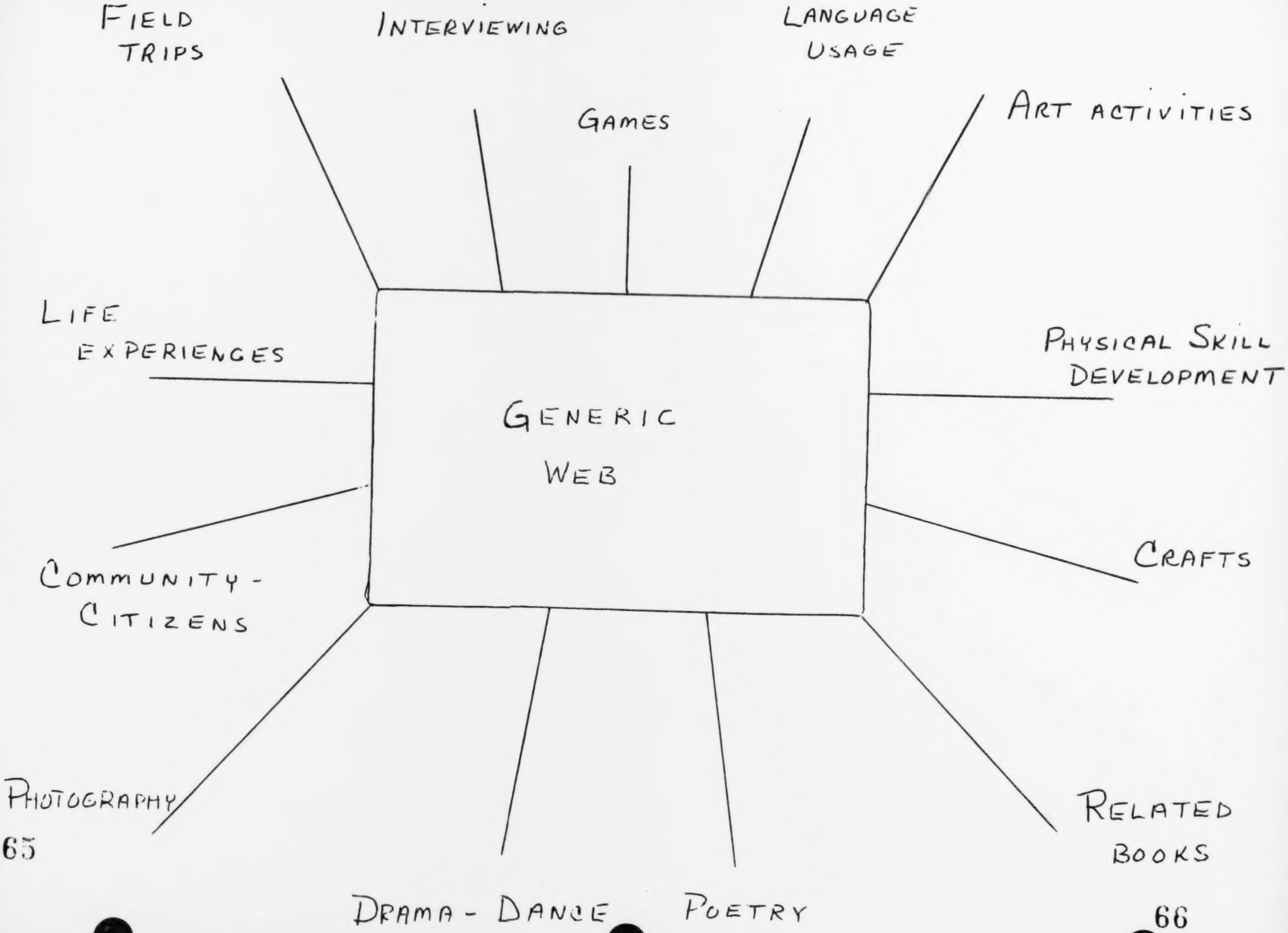
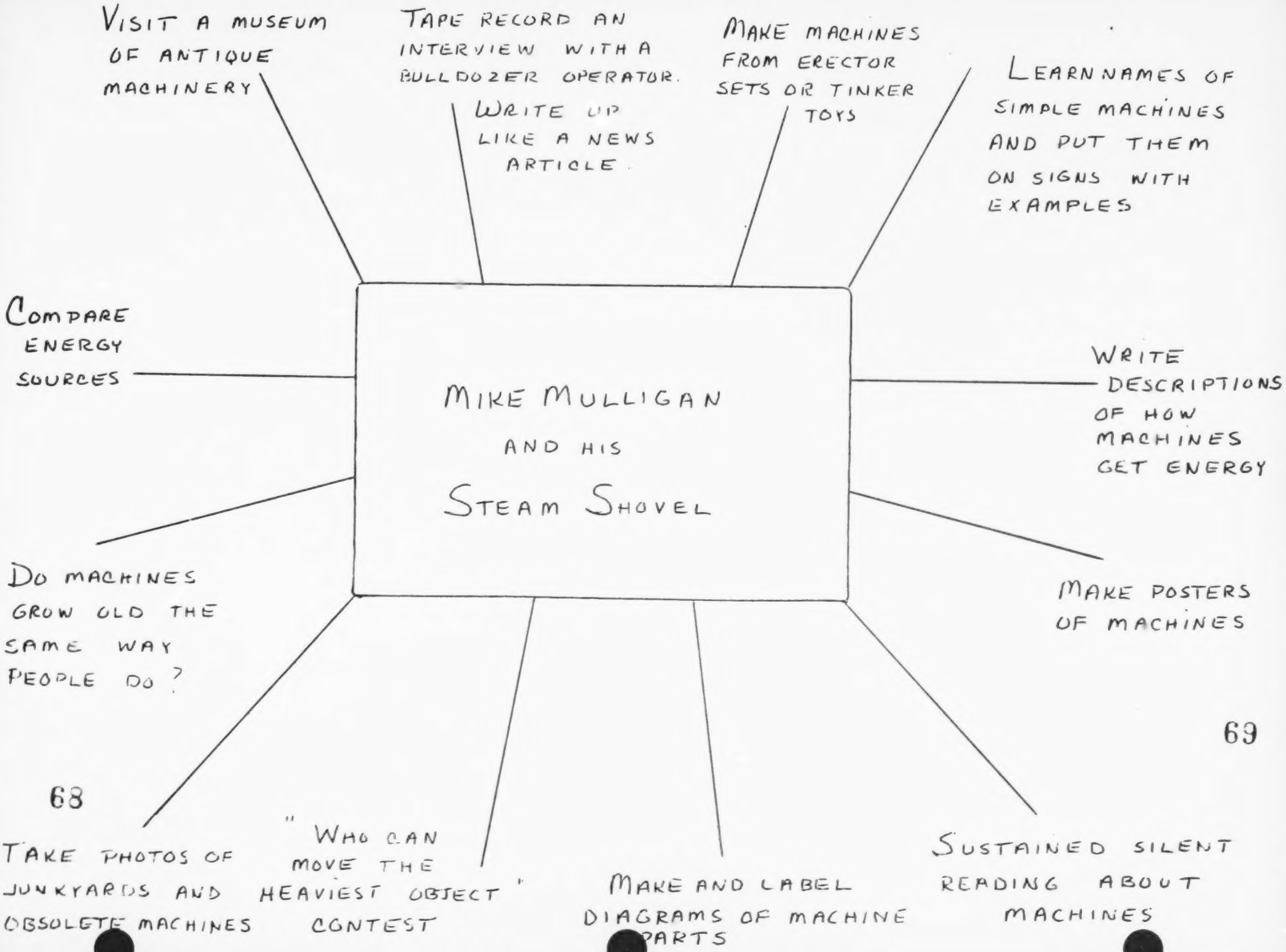

GENERIC WEB
FIELD TRIPS
INTERVIEWING
GAMES
LANGUAGE USAGE
ART ACTIVITIES
LIFE EXPERIENCES
PHYSICAL SKILL DEVELOPMENT
COMMUNITY - CITIZENS
CRAFTS
PHOTOGRAPHY
DRAMA - DANCE
POETRY
RELATED BOOKS

Figure 5. A web for the children's book, Mike Mulligan and His Steam Shovel.



MIKE MULLIGAN
AND HIS
STEAM SHOVEL

VISIT A MUSEUM OF ANTIQUE MACHINERY

TAPE RECORD AN INTERVIEW WITH A BULLDOZER OPERATOR. WRITE UP LIKE A NEWS ARTICLE.

MAKE MACHINES FROM ERECTOR SETS OR TINKER TOYS

LEARN NAMES OF SIMPLE MACHINES AND PUT THEM ON SIGNS WITH EXAMPLES

COMPARE ENERGY SOURCES

WRITE DESCRIPTIONS OF HOW MACHINES GET ENERGY

DO MACHINES GROW OLD THE SAME WAY PEOPLE DO?

MAKE POSTERS OF MACHINES

TAKE PHOTOS OF JUNKYARDS AND OBSOLETE MACHINES

"WHO CAN MOVE THE HEAVIEST OBJECT" CONTEST

MAKE AND LABEL DIAGRAMS OF MACHINE PARTS

SUSTAINED SILENT READING ABOUT MACHINES

Concluding Remarks

It has been our objective to help you learn a way to analyze the contents of text books and fictional works so that you can integrate them into a meaningful unit of instruction. Remember that we stressed that it is better to deal with a few well selected units than it is to cover all the contents of any given text series or state curriculum. We have suggested conceptual analysis to aid you in comprehending and communicating cross links in knowledge between text and fictional works. We have also emphasized the utility of cross links because the research literature tells us that the greater number of cross links the deeper and more useful the knowledge will be.

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Cohen, M. R., et. al. Scott, Foresman Science. Glenview Ill., 1986.

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Revised CMB-JUB 2/8/86

Project
M.A.S.T.E.R

Using Reading Books to Teach Science

Materials developed by M.A.S.T.E.R. elementary teachers, keyed to familiar reading books, are the best illustration of the science/language arts elementary school approach. M.A.S.T.E.R. representatives from 42 public, parochial and private schools met in small-group one-hour workshops organized by grade level. School learning centers and libraries provided the most desirable workshop space. Teachers brought their own favorite readers; the young peoples' librarian of the South Bend Public Library provided a boxful of additional picture and story books. After a general discussion of what it means to "do" science, they looked at their texts and began to brainstorm. John Davis has compiled the results of their collaboration here. Similar activities can help the "Prime Time" public school teacher.

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7. Good Work, Amelia Bedelia
8. Green Eggs and Ham
9. Heidi
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16. Let's Find Out About Christmas
17. Little Mouse on The Prairie
18. Mr. Rabbit and The Lovely Present
19. Nothing Sticks Like A Shadow
20. Popcorn
21. Puff In The Land of Living Lies
22. Rosa - Too - Little
23. Rumpelstillskin

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23. Snow Joe
24. Sometimes Things Change
25. Spot's First Walk
26. "Stand Back - Said The Elephant, I'm Going To Sneeze"
27. Stone Soup
28. The Berenstein Bears Get In a Fight
29. The Biggest House In The World
30. The Curious Cow
31. The Day Jimmy's Boa Ate The Wash
32. The Enchanted Forest
33. The Giving Tree
34. The Golden Book of 365 Straws
35. The Great Town and Country Bicycle Balloon Chase
36. The King Who Could Not Sleep
37. The Velveteen Rabbit
38. Trumpet of The Swan
39. Wet Albert

BOOK TITLE: Birds in the Sky

AUTHOR(S): L. & J. Hawkinson

SCIENCE AREA(S): Animals (birds) Plants (forest)

Suggested grade or grades to be used K-12

ACTIVITIES:

1. Field trip to school grounds or surrounding area.
   Note the different bird habitats such as trees, shrubs, eaves, roofs, ground, etc.

2. In the winter, you may want to put out a bird feeder to bring birds nearer for observation. Feeders should be put out in the fall and kept in operation until summer.

3. Note characteristics and possible changing characteristics of birds in relation to the seasons. You may want to watch how the leaves and insects change as well. Check the leaves for differences in size, shape, and colors. Insects can be observed for size, shape, and color. All students should become aware that insects have six legs and three main body parts.

4. Study bird nests. What are some of the materials they are made of? Do they vary in size? Where are they found? Discourage children from collecting nests. Besides being detrimental to the birds to have their nest removed, many nests contain ticks and mites.

5. Invite a naturalist into the classroom to bring nests. One possible naturalist to contact is Mike Champaign at Fernwood Nature Center, Buchanan, Michigan. The St. Joseph County Parks system also has naturalists.

6. Students can make "bird nests" using shredded wheat. It can be filled with "eggs" (jelly beans) and eventually eaten. For recipe call Ruth Little, 256-0774.

7. Make mobiles of birds to hang from the ceiling. The art teacher might be a resource person.

8. Identify parts of the bird and their function. Resources for this activity such as Peterson's Field Guide, commercial ditto books, etc., are available from school supply stores.

9. Make a study of birds common to our area. Discuss those that migrate and those that don't. Discuss the term migration and concepts included. Seasons may also be discussed with migration.

10. ____

11. ____

BOOK TITLE: Caps for Sale

AUTHOR(S): Esphyer Slobodkina

SCIENCE AREA(S): Animals (monkeys)

Suggested grade or grades to be used: K-2

ACTIVITIES:

1. Investigate various types of monkeys and their relatives (chimps, baboons, squirrel, ape). Resource books can be used to write simple reports. Pictures can be used for comparisons of size, eating habits, social habits, etc.
2. Make models, mobiles, shadow boxes, etc.
3. Visit local zoo to observe the different monkeys or have the zoo naturalist visit the school and bring a monkey.
4. View the National Geographic film by Jane Goodall on the life and social structure of monkeys and apes.
5. Compare geographic locations of where different kinds of monkeys live. Pin pictures of the different kinds of monkeys on to a map showing where they live.
6. Note the climates where monkeys live and how the environment affects their way of life.
7. Compare and contrast humans and monkeys. Discuss why the monkey is classified as a mammal.
8. Roll play life in a monkey family. Have students compare this to their own family.
9. Create a zoo scene with people watching monkeys and monkeys watching and copying behaviors of the people.
10. Develop a mural of monkeys in a zoo or in their natural habitat.
11. ______________________________
12. ______________________________

BOOK TITLE: Charlotte's Web

AUTHOR(S): E. B. White

SCIENCE AREA(S): Animals

Suggested grade or grades to be used: 1 - 4

ACTIVITIES:

1. Make papier mache' animals to construct a farm scene.
2. Collect spider pictures. Count legs. Discuss multiple dexterity.
3. Study various types of eggs (spider, goose, chicken, robin, fish, frog). Discuss attributes of eggs. Classify eggs as to shape, size, or color.
4. Paint chicken eggs.
5. Make "spider webs" use thread, yarn, or string. Try to make patterns like you find in nature or from a nature book.
6. Visit a farm. Feed the animals if possible. Classify animals on form (what they eat, how they help us, which need most attention.)
7. Write a story or poem about the visit to the farm.
8. Make a scrap book about farm animals.
9. Make "bughouse" containers to house spiders. This can be done using a jar that will take a canning ring. Replace the lid with nylon screen that can be purchased at hardware store. Teacher or parent should catch the spiders. Spiders should be released after they have been observed for a few days.
10. Visit the County or State Fair if timing is right. If you cannot visit fair have children recall their attendance at such a fair.
11. Show filmstrip with spiders and webs onto poster board. Students can trace over pictures. These drawings can be used on bulletin boards.
12. ______________________________

    ____
13. ______________________________

    ____

BOOK TITLE: Do Not Open

AUTHOR(S): Brinton Turkle

SCIENCE AREA(S): Ocean and Weathering

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Have students bring in shells or rocks they have collected.
2. Use shells or rocks for art projects.
3. Get a collection of books from library or pictures from magazines such as National Geographic that have to do with ocean life.
4. Use movies from Audio-Visual Department that are about ocean ships.
5. Develop food chains that are found in the ocean. This can be done with drawings or pictures or by having students represent the various animals.
6. Keep a weather chart for several months.
7. To develop abstract thinking, discuss the importance of wheel (ships "steering" wheel).
8. ____________________
9. ____________________

BOOK TITLE: Evan's Corner

AUTHOR(S): Elizabeth Starr Hill

SCIENCE AREA(S): Humans

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Read the story to class and discuss.
2. Show the film Evan's Corner. It can be obtained from the South Bend Public Library.
3. This can be tied into the neighborhood study in social studies.
4. Discuss the concept of and the consequences of sharing.
5. Maintain a goldfish in the classroom. Have students share in the responsibility of care.
6. Discuss to reason why turtles are not the best of pets. They often carry a serious disease called Salmonella. You must always wash hands with soap after handling a turtle.
7. ____
8. ____

BOOK TITLE: George's Marvelous Medicine

AUTHOR(S): Ronald Dahl

SCIENCE AREA(S): Chemistry (mixtures)

Suggested grade or grades to be used: 3

ACTIVITIES:

1. Invent your own mixture. Use "safe" classroom materials (salt, food coloring, cooking oil, pop, sugar, etc.). Observe which mixtures sink or float, which dissolve, reach saturation, what happens when mixtures are put together. If you have access to E. S. S. materials there is a kit on this topic.
2. Write a story about a mixture (factual or creative).
3. Have children go thru their home with parent and make a list of chemicals found in the home.
4. Make a collage about household chemicals or have a class poster contest on household chemicals.
5. Make a list of harmful and harmless chemicals found in the home.
6. Have students make their own "Mr. Yuk" labels to take home and place in proper items.
7. Classify the safe chemicals that are used in activity - 1 -- as to acid or base, (use PH paper), solid, liquid, or gas.
8. Discuss simple machines that are involved in operating a crane. Why do we use cranes?
9. Discuss abnormal growth (anorexia, aging, diseases, and growing large because of the lack of exercise.)
10. Discuss self concept of child who grows faster than others or that are shorter or heavier than the average.
11. ______________________________

    ____
12. ______________________________

    ____

BOOK TITLE: Good Work, Amelia Bedelia

AUTHOR(S): Peggy Parish

SCIENCE AREA(S): Problem Solving

Suggested grade or grades to be used: 1 - 3

ACTIVITIES:

1. Play games that emphasize the importance of following directions.
2. Give students situations where they will need to identify them as fact or fantasy.
3. Have students pot plants. Cuttings such as coleus or geraniums.
4. Bake bread. Emphasize the use of measurement of ingredients and time.
5. Set up a pulley system to demonstrate how pulleys can be used to make work easier.
6. ______________________________
7. ______________________________

BOOK TITLE: Green Eggs and Ham

AUTHOR(S): Dr. Seuss

SCIENCE AREA(S): Nutrition

Suggested grade or grades to be used: K - 2

ACTIVITIES:

1. Discuss the four basic good groups.
2. Collect pictures from magazines of the four basic food groups.
3. Make posters of the four basic food groups.
4. Have a tasting party. Use unusual combinations such as cabbage and peanut butter.
5. Have students help plan the school menu.
6. Blind fold students. See if they identify goods by smell/touch.
7. With parents help have student record what they have eaten for a given period of time.
8. Color eggs green. (St. Patrick's Day)
9. Use primary colors to make secondary colors. (blue and yellow = green).
10. Spin an eight color wheel to produce white.
11. Make a list of all the foods that will rhyme with egg or ham.
12. Write a poem about a favorite food.
13. Make a collection or draw pictures of how different animals move.
14. Make an animal diorama.
15. Creat unusual animals. (use imagination).
16. ______________________________
17. ______________________________

BOOK TITLE: Heidi

AUTHOR(S): Johanna Spyri

SCIENCE AREA(S): Mountains -- Climate

Suggested grade or grades to be used: 3

ACTIVITIES:

1. Discuss how mountains effect climate.
2. Discuss how mountains effect the life of plants and animals.
3. Discuss uses of wool and why it makes such warm clothing.
4. Discuss how the diets of people in cold climates differ from those in warm places.
5. Investigate how snow is formed.
6. Make posters that show good winter health habits.
7. Visit Logan Center to help understand handicapped.
8. ______________________
9. ______________________

BOOK TITLE: How To Eat Fried Worms

AUTHOR(S): Thomas Rockwell

SCIENCE AREA(S): Animals - Worms

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Have students role play the life habits and feelings of a worm.
2. Maintain a colony of earthworms in the classroom. This can be done in a large coffee can with holes punched into a plastic lid. They will feed on coffee grounds and decaying leaves.
3. Eat sausage "worms".
4. Have students observe worm behavior. Use Master I Workshop sheet, "The Earthworm Should Be IN School."

5. ______________________________

____

7. ______________________________

____

BOOK TITLE: I Was Walking Down The Road

AUTHOR(S): Sarah Barchas

SCIENCE AREA(S): Animals

Suggested grade or grades to be used: K - 1

ACTIVITIES:

1. Discuss and make a list of the differences in the lives of domestic and wild animals.
2. Discuss with students how animals might react to certain situations.
3. Have students make a list of the feelings they think animals have.
4. ______________________________
5. ______________________________

BOOK TITLE: Isabel Quacks

AUTHOR(S): Grace and Olive Barnett

SCIENCE AREA(S): Animals

Suggested grade or grades to be used: 2

ACTIVITIES:

1. Play the game "Guess My Animal".
2. Sing "Old MacDonald". Discuss feelings shown by it's sounds.
3. Discuss the purpose of animal sounds and how they are used to communicate with their own species and with humans.
4. Watch the movie "Dr. Doolittle's Talk With The Animals".
5. Use puppets for role playing of feelings expressed by the animal in given situations. (with owner, in danger, hurt, etc.).
6. Use tuning fork or rubber band instruments to develop sounds and for showing vibrations.
7. Dip tuning fork into water after it has been struck to show how sound travels.
8. Using rubber bands -- pull to different tightnesses -- to show how sound travels.
9. Study how our ears receive and interpret sounds.
10. Write a story that shows interrelationships of the animals that live on a farm.
11. Collect pictures or make drawings of what animals eat.
12.
13.

BOOK TITLE: Julius

AUTHOR(S): Syd Hoff

SCIENCE AREA(S): Animal Behavior

Suggested grade or grades to be used: 1 - 2

ACTIVITIES:

1. Collect pictures or draw pictures that illustrate the same animal in various habitats. Example: a tiger in the jungle, circus, or zoo.
2. Demonstrate gravity -- how it effects a football and a coconut in the same way.
3. Make a list of various animals that are good pets.
4. Pick a particular pet and list all the things that must be done to give that animal proper care.
5. ____________________
6. ____________________

BOOK TITLE: Jumanji

AUTHOR(S): Chris Van Allsburg

SCIENCE AREA(S): Animals -- African Wildlife

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Make a mobile using mammals that live in Africa.
2. Invent a simple board game that involves the animals of Africa.
3. Select an animal and give a report. Include where it lives, what it eats, its enemies, its family life, etc.
4. Explain the care that must be given to family pets.
5. Make a food cycle mobile.
6. Make a collage of animals of Africa.
7. ______
8. ______

BOOK TITLE: Legend of Sleepy Hollow

AUTHOR(S): Washington Irving

SCIENCE AREA(S): Weather and Nature

Suggested grade or grades to be used: 3

ACTIVITIES:

1. Make observations at school or at home regarding seasonal changes in weather, trees, plants, animals, habits, or insects.
2. Make leaf collections.
3. Make seed collections.
4. Study seed dispersal.
5. Make a list of seasonal recreational activities.
6. Make sketches of seasonal changes in trees, flowers, birds, etc.
7. Make paintings in seasonal colors.
8. Make leaf rubbings.
9. Develop booklet of seasonal changes. Might include creative stories, and illustrations. Can be a class booklet or individual pupil booklets. Can be for each season separately or all four.
10. Keep weather observation/records.
11. Record changes in time of sunrise and sunset for at least a month.
12. Make a collection of pictures or a collage that demonstrates the differences in clothing, storms, type of precipitation, temperature, etc. for each season.
13. Draw the different phases of the moon.
14. Visit a pumpkin patch. Observe, measure, learn about the care of growing and harvesting of pumpkins.
15. Carve pumpkins. Save seeds to plant, dry, roast, or for winter birds.
16. Plant pumpkins. Observe how plant grows.

17. List uses of pumpkins. Collect recipes (bring a favorite one from home).
18. Make model horses from clay. (If kiln is available bake and paint).
19. Make a list of types of horses and what they do.
20. Research history of the horses development.
21. Discuss provisions made for old horses.
22. Make a list of foods mentioned in the story (especially at party) classify them according to the four food groups. Discuss amounts of foods from each group to be eaten daily for a healthy, growing child.
23. Collect pictures of present day foods and chart according to the four food groups. Discuss snack foods.
24. ______________________________

    ____
25. ______________________________

    ____

BOOK TITLE: Let's Find Out About Christmas

AUTHOR(S): Franklin Watts

SCIENCE AREA(S): Plants

Suggested grade or grades to be used: K - 3

ACTIVITIES:

1. Grow a poinsetta. Best grown from cuttings. Needs special care to bloom at Christmas time.
2. Study the growth of a tree.
3. Study and examine holly. Make a wreath.
4. Visit a Christmas tree farm.
5. Examine a snowflake under magnifying glass. Must be done outside to prevent melting.
6. Make ornaments out of dough.
7. ____________________
8. ____________________

BOOK TITLE: Little Mouse On The Prairie

AUTHOR(S): Stephan Cosgrove

SCIENCE AREA(S): Seasons

Suggested grade or grades to be used: ____________________

ACTIVITIES:

1. Study the changes of seasons. What happens to plants and animals during each season. Could develop a collage for each season.
2. Make a list of things animals to prepare for winter.
3. From pictures decide what the differences are between a meadow and a field.
4. Keep a record of differences between fall and winter temperatures.
5. Keep a season tree, put green leaves on for summer, brown leaves for fall, ice/snow in the winter, and buds in the spring.
6. ____________________

   ____
7. ____________________

   ____

BOOK TITLE: Mr. Rabbit and The Lovely Present

AUTHOR(S): Charlotte Zolotow

SCIENCE AREA(S): Color and Nutrition

Suggested grade or grades to be used: 2

ACTIVITIES:

1. Bring various fruits and make fruit salad.
2. Write a story about colors.
3. Make a color wheel.
4. On a nature walk try to find as many colors as possible.
5.
6.

BOOK TITLE: Nothing Sticks Like a Shadow

AUTHOR(S): Ann Tompest

SCIENCE AREA(S): Light -- Shadows

Suggested grade or grades to be used: K - 3

ACTIVITIES:

1. Use a projector or overhead as a light source and make shadows. Observe where object must be in relation to the light source in order to produce a shadow.
2. Place object in front of light source and have children guess what it is from the shape of the shadow.
3. Use newspaper or weather report to record sunrise and sunset.
4. Observe where the sun rises and the sun sets for a month.
5. Have children measure shadows in morning sunlight and again at noon. Discuss why they are different.
6. Play shadow tag.
7. Make silhouettes.
8. __________
9. __________

BOOK TITLE: Popcorn

AUTHOR(S): Frank Asch

SCIENCE AREA(S): Plants - animals

Suggested grade or grades to be used: K - 1

ACTIVITIES:

1. Compare popcorn with field corn and sweet corn.
2. Make popcorn. What is needed?
3. What makes popcorn pop? Discuss.
4. Experiment with field corn and sweet corn. Will it pop?
5.
6.

BOOK TITLE: Puff In The Land of Living Lies

AUTHOR(S): Romeo Muller

SCIENCE AREA(S): Animals - imaginary

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Have student compose lists of facts and fantasies.
2. Make model cave.
3. List characteristics of real living animals.
4. Make a scrapbook containing a section on living animals, extinct animals, and imaginary animals.
5. ______________________________
6. ______________________________

BOOK TITLE: Rosa Too Little

AUTHOR(S): Sue Felt

SCIENCE AREA(S): Weather

Suggested grade or grades to be used: K - 2

ACTIVITIES:

1. Set up a light source and make shadows.
2. Make silhouettes.
3. Make a simple sundial.
4. Keep weather charts for given period of time.
5. Make collages of the four seasons.
6. Use pictures to show how each season affects a tree.
7. Have children draw pictures that are representative of the four seasons.
8. Ask a local weatherman to come to your class to explain what he does and how his services are important to various people.
9. Discuss how we grow and what is needed for our growth.
10. Use a human body model to identify basic body parts.
11. List some ways in which our bodies may differ.
12. Discuss how we react to others and how we can effect the feelings of others.
13. ____
14. ____

BOOK TITLE: Rumpelstillskin

AUTHOR(S): Edith H. Tarcow

SCIENCE AREA(S): Plant (grains-straw)

Suggested grade or grades to be used: 2

ACTIVITIES:

1. Make a list of items made from straw.
   List of how straw may be used.
2. Braid straw or make simple objects from straw.
3. Weave place mats from straw, paper, or plastic.
4. Make pot holders. Use small loom and fabric loops.
5. Collect various grains to observe (corn, oats, wheat, rye, barley, etc.) Discuss some of the uses of each grain.
6. Demonstrate how Indians and used stones to grind grain.
7. Make course flour using small amount of grain in blender or hand mill.
8. Make corn bread from corn meal ground by students.
9. Make whole-wheat bread with flour ground by hand mill.
10. Use puppets to portray the story of Rumpelstillskin.
11.
12.

BOOK TITLE: Snow Joe

AUTHOR(S): Carol Grume

SCIENCE AREA(S): Weather

Suggested grade or grades to be used: K - 1

ACTIVITIES:

1. Play in the snow. Make snowmen, sculptures, angels, snow balls, etc.

2. Observe snow from several different snow-storms. Should find that snow is not always the same. Keep records of temperatures and watch for relationship between type of snow and temperature. See if you can get children to predict type of snow as to temperature at the time.

3. Melt a measured amount of snow and see how much water it will yield. Try this with several different snows. keep records of amount of water yield. Look for a relationship to activity number 2 above.

4. Examine a snowflake. On a cold day go outside taking with you a hand lens and a piece of dark cloth or cardboard. Catch a falling snowflake and examine. Now catch several more and examine them. Students should reach conclusion that they all are basically alike but no two are identical.

7. ______________________

8. ______________________

BOOK TITLE: Sometimes Things Change

AUTHOR(S): Patricia Eastman

SCIENCE AREA(S): Change

Suggested grade or grades to be used: K - 1

ACTIVITIES:

1. Grow meal worms. (larvae, worms, beetles).
2. Melt ice to make water.
3. Freeze water to make ice.
4. Boil water to make steam.
5. Cool steam to make water.
6. Make popcorn. Use glass container if possible so you can see kernel expand. Discuss what actually happens to make the kernel pop.
7. Hatch eggs. Attempt this only if you have proper equipment or can turn eggs every day. Make sure you have proper home for chicks.
8. Make butter. Use both butter and butter milk.
9. ____
10. ____

BOOK TITLE: "Stand Back - Said the Elephant, I'm Going To Sneeze"

AUTHOR(S): Patricia Thomas

SCIENCE AREA(S): Animals

Suggested grade or grades to be used: 1 -2

ACTIVITIES:

1. Have students discuss, in general terms, the different groups of animals they can identify. (Mammals, fish, birds, reptiles, insects).
2. Discuss what causes a sneeze and what we, humans should do when we sneeze.
3. Make a list of things an elephant can do with his trunk.
4. Discuss how animals may help one another.
5. Make lists of animals that usually are friendly to people and those that are often hostile to people.
6. Have students attempt to make sounds of animals. You might want to tape these.
7. Make a list of characteristics that are common to humans and animals.
8. Make a jungle diorama.
9. Visit the zoo.
10. ______
11. ______

BOOK TITLE: Stone Soup

AUTHOR(S): Marcia Brown

SCIENCE AREA(S): Nutrition

Suggested grade or grades to be used: K - 3

ACTIVITIES:

1. Make soup. Have children bring vegetables, let them clean and cut them up. Eat the soup when it has finished cooking.
2. Take a trip to Farmer's Market or grocery store to purchase vegetable for making soup.
3. Visit a soup kitchen.
4. Keep a list of all foods eaten for a week. Discuss the four food groups. Check and see how well -- their lists had met the needs of the four food groups.
5. Have each student make a menu for a day. Make sure it includes the four food groups.
6. Collect rocks and classify them by color, hardness, size, and shape.
7. Decorate rocks for paper weights or door stops.
8. Make a list of how stone and rock can be used.
9. Grow vegetables in the classroom. Can be planted in coffee cans, buckets, 2-liter pop bottles.
10. Create a climate map.
11. keep daily weather records.
12. Observe microscope slides of plant leave and roots.
13. Observe onion skin under the microscope.
14. ______________________________
15. ______________________________

BOOK TITLE: The Berenstein Bears Get In a Fight

AUTHOR(S): Stan and Jan Berenstein

SCIENCE AREA(S): Animals - Behavior

Suggested grade or grades to be used: 1 - 2

ACTIVITIES:

1. Classify objects as living or non-living.
2. Use a prism to make a "rainbow".
3. Have students draw rainbows. Have them observe prism rainbows to get colors in right positions.
4. Discuss a thunderstorm. What do you see? What do you hear? How should you protect yourself.
5. Have students develop a skit concerning an argument. Then develop another skit on how to peacefully resolve family problems.
6. ____________________
7. ____________________

BOOK TITLE: The Biggest House In The World

AUTHOR(S): Leo Lionni

SCIENCE AREA(S): Animals - Snails

Suggested grade or grades to be used: 1 - 4

ACTIVITIES:

1. Keep snail in a fish bowl or large jar in the classroom. Let children care for it.
2. Use hand lens to observe the snails. How they eat, move, etc.
3. Research snails. Do they all have same shape shells? Do they all have shells? Are their shells all the same color? Do they all live in water?
4. Create a model of a snail from clay or scrap material.
5. Include a land snail or a "slug" in a classroom terrarium, observe and record its activities.
6. Draw and label parts of snail. (shell, foot, feelers, mouth).
7. Discuss the similarities of people who travel in mobile homes and R.V.'s and snails.
8. Discuss where shells can be found and how they are made.
9. Discuss the moral of the book. "Don't bite off more than you can chew.
10. Write stories, factual or fantasy, about snails.
11. ____________________
12. ____________________

BOOK TITLE: The Curious Cow

AUTHOR(S): Ester K. Meeks

SCIENCE AREA(S): Animals (cow) Simple machines Nutrition

Suggested grade or grades to be used: K - 12

ACTIVITIES:

1. Acquaint students with simple machines. (Pulley, lever, wheel, wedge). Demonstrate how they help us do work.
2. Use ESS unit Clay Boats to introduce how and why things float.
3. Visit a dairy farm.
4. Show a movie or filmstrip about diary farming.
5. Discuss the life and habits of a cow.
6. Collect pictures that illustrate there are different kinds of cows.
7. Visit a milk processing plant to learn about pasteurizing. How it is done and why it is important.
8. Research what cows eat.
9. Observe how a cow is milked. (hand or machine)
10. Find out how the farmer cares for the milk until it is taken to the processing plant.
11. Have a tasting party of dairy products. Ice cream, butter, cottage cheese, yogurt, powdered milk, whole milk, skim milk, 2% milk, buttermilk, various cheeses.
12. Make a list of foods that we use milk to prepare.
13. Visit meat market to identify different cuts of meat and different parts of cows that we eat.
14. Use materials available from the National Dairy Council.
15. Invite speaker from Indiana Farm Bureau to make presentation on farm life.

16. Compare Kathy's curiosity with that which children often have.

17. Discuss advantages and disadvantages of being curious.

18. Relate this story with Curious George stories.

19. Make a papier mache', clay, or pipe cleaner cow.

20. Draw or paint cows.

21. Develop critical thinking by stopping at time when cow comes to hole - how would you? Do the same at how to get out of kitchen - how would you?

22. ______________________________

____

23. ______________________________

____

BOOK TITLE: The Day Jimmy's Boa Ate The Wash

AUTHOR(S): Steven Kellogg

SCIENCE AREA(S): Animals - Snake and Farm Life

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Visit a farm.
2. Visit a snake exhibit - zoo.
3. Discussion of cause/effect: "What if chickens quit laying", etc.
4. Discuss life of a snake. Where lives, what it eats, its enemies. how often it eats, shedding the skin, etc.
5. Write stories concerning strange or unusual pets.
6. Discussion of importance of rules.
7. ____________________
8. ____________________

BOOK TITLE: The Giving Tree

AUTHOR(S): Shel Silverstein

SCIENCE AREA(S): Plants (trees)

Suggested grade or grades to be used: K - 3

ACTIVITIES:

1. Draw and name parts of a tree.
2. Discuss and classify the different types of trees.
3. Take a nature walk. Collect leaves.
   Develop a project of leaf identification.
4. Make rubbings of leaves.
5. Use filmstrip on lumbering.
6. Do word search or crossword puzzle to give uses of wood.
7. Have students make a list of all the things used in one day that are made of wood.
8. Visit an orchard. Find out how fruit trees must be cared for, how fruit is picked and cared for before we receive it to use.
9. Make a list of all the foods we get from trees.
10. Make applesauce or apple butter.
11. Make apple head dolls.
12. Visit a maple sugar farm.
13. ______________________________

    ____
14. ______________________________

    ____

BOOK TITLE: The Golden Book of 365 Stories

AUTHOR(S): Kathryn Jackson

SCIENCE AREA(S): Time

Suggested grade or grades to be used: K - 3

ACTIVITIES:

1. Visit a weather station.
2. Have a meteorologist visit the class.
3. Keep weather records for a month.
4. Visit the planetarium.
5. Make drawings showing day and night.
6. Winter weather lessons. Discuss appropriate clothing to wear.
7. Summer weather lessons. Discuss how clothing can make you comfortable or uncomfortable.
8. ______________________________

   ____
9. ______________________________

   ____

BOOK TITLE: The Great Town and Country Bicycle Balloon Chase

AUTHOR(S): Barbara Douglas

SCIENCE AREA(S): Air

Suggested grade or grades to be used: K - 4

ACTIVITIES:

1. Teach children how to use a map.
2. Have students make simple maps. School grounds, etc.
3. Demonstrate how air movement can cause things to move or rise. Use fan or heat.
4. Discuss what makes hot air balloons float.
5. Compare how hot and cold air effects a balloon.
6. Make a list of the differences between zoo animals and farm animals.
7. Discuss the differences between life on the farm and life in the city.
8. Draw and color hot air balloons.
9. Send up helium filled balloons with self addressed cards attached so they can be returned. Determine which direction the winds blow.
10. ____
11. ____

BOOK TITLE: The King Who Could Not Sleep

AUTHOR(S): Benjamin Elkin

SCIENCE AREA(S): Senses

Suggested grade or grades to be used: 1 - 2

ACTIVITIES:

1. Determine or define what is noise. Sounds that are unpleasant, extra loud, high pitched, etc.
2. Discuss how our bodies react to noise.
3. While blindfolded try to distinguish what is making a particular sound.
4.
5.

BOOK TITLE: The Velveteen Rabbit

AUTHOR(S): Margery Williams

SCIENCE AREA(S): Animals (rabbits)

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Have children touch a variety of fabrics and other materials. Classify the objects by textures as rough, smooth, slick, etc. Be sure to include a piece of velvet. If possible have a piece of animal fur. If you use animal fur, be sure to check if any children are allergic to fur.
2. Make a list of communicable diseases. Find out the incubation period, symptoms, treatment, prevention, and if vaccination is available.
3. Make graph showing the most common communicable diseases in United States and in the world.
4. Make posters stressing prevention of communicable diseases.
5. Make a booklet for the seasons.
   Include: appropriate clothing, weather conditions, length of day.
6. Write stories about the seasons.
7. Discuss favorite food for each season.
8. List fun things to do each season.
9. Make clay or playdough figures of rabbits.
10. Make papier mache' rabbits.
11. Make drawings of rabbits.
12. List of how rabbits are used by man. (food, fur, pets)
13. Discuss a rabbits life in nature. What they eat.
    Where they live. Who are their enemies.
    How do they protect themselves, etc.

14. Show film of The Velveteen Rabbit.

15. ____

____

16. ____

____

BOOK TITLE: Trumpet of the Swan

AUTHOR(S): E. B. White

SCIENCE AREA(S): Animals - birds

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Make a scrapbook of birds.
2. Hatch eggs. Must have right equipment or be available to turn eggs every day. YOU CANNOT MISS ONE DAY. Have a proper home for the chicks. DO NOT send home with students.
3. Draw a bird and label body parts.
4. Observe pictures and observe differences in bird size, shapes, beaks, feet, etc.
5. Try to predict from beaks or feet what birds eat or where they live.
6. Write a report on how a bird learns to fly.
7. ____________________

   ____
8. ____________________

   ____

BOOK TITLE: Wet Albert

AUTHOR(S): Michael and Joanne Cole

SCIENCE AREA(S): Weather

Suggested grade or grades to be used: 2 - 3

ACTIVITIES:

1. Have students research in library on how clouds are formed.
2. Draw an illustration of the water cycle.
3. Demonstrate a plants need for water.
   Plant two (2) seeds. Water one and not the other.
4. Make collage of clothing to wear in the rain.
5. Test various materials for waterproofness. (paper, wood, plastic, rubber, leather, cotton, etc.) Lay material on a paper towel, use eye dropper and use three drops of water on each sample. Check to see if water leaks through.
6. Make a bulletin board of uses of water. Use magazines or student drawings.
7. Make a list of uses of water.
8. Collect pictures and lists of different types of transportation.
9. Use globes or maps to show where Wet Albert traveled.
10. Learn the names of the continents.
11. Keep a chart of daily weather.
12. Visit a pond in spring. Observe tadpoles.
13. Observe as many insects as possible on the school yard.
14. ______________________________
15. ______________________________

BOOK TITLE: Spot's First Walk

AUTHOR(S): Eric Hill

SCIENCE AREA(S): Five Senses

Suggested grade or grades to be used: K - 1

ACTIVITIES:

1. Take a walk on the school grounds and classify as many objects as you have time to identify. You might classify them as living or non-living, big or small, by color or by general shape.
2. On the playground listen for sounds. Classify them as loud or soft, pleasing, or non-pleasing, near by or far away, etc.
3. Touch as many items as can be found in the classroom. Classify them as hard or soft, smooth or rough, warm or cold, wet or dry, sticky or non-sticky.
4. Smell various items or objects found in school. Classify them as pleasing or non-pleasing.
5. Have students develop a group of objects that have a variety of characteristics, such as a penny, sandpaper, fake fur, cotton, tin foil, feather, etc. Then have them develop a sentence for each object that lists its characteristics. This can be made into a game if there are enough objects involved. A student can give the list of characteristics and others try to identify it.
6. Have a tasting party. Identify foods as being sweet, sour, salty, or bitter.
7. ____________________
8. ____________________

Science Basics for Elementary Teachers

During the project year, we provided demonstration and hands-on workshops for M.A.S.T.E.R. teachers not only to give them classroom equipment but to show them how to make and use it--from the ground up. Participants found that with very inexpensive kits and materials available at local hardware and craft shops, they could bring animal and plant life into the classroom. By making terrariums, aquariums, and mini-scopes themselves, they all became potential workshop leaders for others in their schools. Many participants voluntarily conducted such workshops during 1986, using the supplemental hand-out materials designed by John Davis, and included here.

USES OF SEEDS IN THE CLASSROOM

By John V. Davis: Coordinator of Science and Health Education
South Bend Community School Corporation

Probably one of the simplest activities to have students do with seeds is to collect them. If one would work hard enough and long enough at collecting seeds, they would eventually end up with almost every shape and color, plus a variation in size from microscopic to those that weigh several pounds.

Since there is such variety in seeds, a seed collection is a good tool to use in teaching classification. You can use such characteristics as shapes, colors, shiny or dull, fuzzy or smooth, solid color or speckled, etc.

Few persons realize that a seed is a living organism and that its protoplasm is just as much alive as is the protoplasm of a cat or dog. Inside each seed is a tiny living embryo (miniature plant) with a supply of food. The seed is just waiting to be placed in the proper conditions to start cell reproduction.

It is easy to observe the embryo and food supply in some seeds. To observe them in bean seeds you need to soak them in water for six to eight hours. If possible, it is best to get seeds from a food store or farmer. Seeds purchased from a seed store often have chemicals on them to retard fungus growth. If you get seeds from a seed store, be sure to warn students not to put them in their mouth and have them wash their hands after handling the seeds. After the beans have soaked, the students can use their thumb nails to break them open. Much to their surprise, they will see a tiny little plant complete with leaves. All of the material, other than the plant embryo, is stored food. At this time, some of the bean seeds could be planted in soil so that the students can observe the plant as it develops.

You may have a bright student who will point out the fact that he or she has seen the same type of tiny plants in peanuts or peas. If no one comes up with this, you might bring in some peanuts and let them find the little plant. They will need to realize that if the peanuts have been roasted or processed in any way for eating, the little plant is no longer alive.

To see the embryo and food supply in the corn seed, soak it for several hours until it softens. Lay the seed down flat and cut it lengthwise with a razor blade. For safety reasons, the teacher should probably do the cutting. The stored food in a corn seed is starch. If you have the students place a drop of iodine on the cut section, the starch will turn a purplish black and you can then easily see the little blade like leaves of the embryo plant. Some corn seeds should be planted so that the students can compare the early development of the corn plant with the early development of the bean plant.

A number of bean and corn seeds should be laid between damp paper towels on a metal or plastic tray and stored in a dark place, (cupboard or drawer). Make sure that the towels are kept damp, but not soaked. The students should observe the seeds daily for about two weeks. This will allow them to observe where and how the roots and stems develop and will bring out the fact that the roots grow much faster than the stem and that the amount of root exceeds the amount of stem.

The students could attempt germinating seeds under various conditions such as: temperatures from refrigerator to heating unit, placing seeds in light and dark, placing seeds in various depths in soil. If accurate records are kept of the various plantings, the students should be able to put all of their results together and come up with the external conditions needed for seed germination. These conditions are: moisture (in abundance, but not water logged), oxygen, temperature (usually best between 70° = 80°, not below freezing or above 115°), usually darkness (by covering with soil, however, some light penetrates soil, so depth of planting is important).

This observation must be done in the fall. Using corn seed that has been purchased and an ear of corn just taken from the field, have the students plant some of each type of seeds. Which germinates best? Take some of the smaller or misshapened seeds from near the end of the ear and plant them. Do they germinate? These two tests bring out two of the very necessary internal conditions needed for seed germination which are: sufficient stored food and completion of dormancy (period of rest).

You could use several different kinds of garden seeds and have a number of students plant each according to directions. Have them keep records as to how long it takes each kind to germinate. If they will compare their records, they will see that all seeds do not germinate in the same time. Seeds of each plant have their own germination time. Even seeds of the same plant do not all germinate at the same time. The students should be encouraged to develop theories as to why all seeds do not germinate within the same time frame.

DEVELOPING A TERRARIUM

By John V. Davis: Coordinator of Science and Health Education
South Bend Community School Corporation

A terrarium is a little bit of nature (the out of doors) brought into the classroom. It can be one of the most useful tools that a classroom teacher can have at his or her disposal.

To develop a terrarium it is necessary to have a suitable container. It must be capable of holding a limited amount of moisture. A terrarium does not have to be of any particular size or shape. There are many types of containers that can be purchased from biological supply houses or more decorative types may be purchased from floral suppliers. These types of containers are extremely expensive and have no advantages over types that you can make or secure for only a fraction of the cost.

An old aquarium that is no longer perfectly water tight makes an excellent terrarium container. If you have your students each make their own small terrarium, an old fish bowl or a gallon jar, such as restaurants receive pickles, catsup, etc. in, are excellent. Even a gallon jug can be used; it is just more difficult to plant.

An inexpensive way to make a terrarium is to purchase a large baking sheet with a slight edge on it. Or, you could make, or have made, a metal sheet with an edge not more than one inch in height. Measure the flat bottom area of the sheet. Be careful, because most baking sheets are slightly rounded where the bottom and the edge come together. Also watch for rounded corners. After you have the measurements, purchase two pieces of single strength glass that are the length minus at least one-half inch X 12 inches, and two pieces of single strength glass that are the width minus at least one-half inch X 12 inches. Make a rectangle using these pieces and tape the corners with adhesive tape. Glue can be used, however, I prefer tape because it allows for the terrarium to be dismantled and stored in a small area. It also makes it possible to replace a broken piece of glass.

Place the glass rectangle on the metal sheet and fill the spaces between the glass and the edge of the metal sheet with soil, sand, or small aquarium gravel. This will hold the glass in place.

You need one more piece of glass with measurements one inch larger than the opening of your rectangle. This will be used as the cover or lid. For safety, I would suggest that you tape all exposed glass edges. This may save someone (maybe you) a nasty cut. If you find the taped edges sticking to one another or the glass top, rub a little talcum or baby powder on the tape.

I would caution that there is a limit to the size of terrarium you can make in this manner. I would not recommend more than 12 inches in depth or height, and 18 inches in length.

You might use plastic in place of glass, but keep in mind that it will scratch.

After you have a suitable container, it is very important that you make proper preparations for planting. In this paper we will concern ourselves with the development of a Woodland Terrarium. (Keep in mind that other kinds of terrariums might be developed, such as desert, bog, and semi-aquatic.) In a woodland terrarium, it is very important that proper drainage is assured. Without drainage the soil will become water logged, the plants cannot get air and your terrarium will die and rot. To assure drainage, the floor (bottom) of the container should be covered with approximately 1" of a material that will not pack tight, and will leave large airspaces between particles. Good materials for this are: gravel, clay chips, redwood chips, marble chips, and marbles. ***Never use crushed limestone.***

To help regulate acidity and to cut down on the growth of mold, cover the materials you used for drainage with a thin layer of activated charcoal. Activated charcoal can be purchased in pet stores. It is used in aquarium filters. The charcoal should be covered with several inches of soil. You may use purchased potting soil, or you could make a mixture of two parts soil, two parts compost, and one part sand. You may want to landscape the soil, and add a small pool. A shallow dish or jar lid makes a fine pool. Keep in mind that small animal life may drown in a pool.

You are now ready to plant. Use plants that are native, not ornamental. The best plants to use are those which have fibrous (spreading) root systems. Plants with tap roots, such as the dandelion, will not grow well in a terrarium. Examples of plants that will do well in a terrarium are: wild strawberry, grass, clover, wood sorrel (sour grass), sheep sorrel, common plantain, English plantain, and mint. The biggest problem you will have will be to keep from putting too many plants in your limited space.

To make an interesting woodland terrarium you should include one or more herbacous plants such as those on the above list, one or more types of moss, and possibly a fern. If they are available, nice additions include lichen or a fungi (the best are cup fungi, puff balls, or shell fungi.) You can also add interest by including items such as rocks, nuts, seeds, sticks or pieces of bark.

To make your terrarium complete, you should have some animal life. This will also increase the students' interests. The biggest mistake is to use animals that are too large and tear everything apart. This is what usually happens when turtles, frogs, large toads, lizards, etc. are placed in a terrarium. We often overlook the most obvious types of life to use, such as earthworms, insects, salamanders, snails, tree frogs. Even with these animals, some damage such as chewing on leaves, digging, etc. should be expected.

The two most serious problems in keeping a terrarium healthy are controlling water and light. To get the proper amount of water in the soil, add water very slowly while you watch the drainage material in the bottom of your terrarium. At the first sign of water draining into this area, stop watering. This will allow air spaces for the roots. The roots will die and start to rot if you waterlog the soil and fill all of the air spaces.

A terrarium will grow best in a east or north window. They will also do well under artificial light, particularly if it is a combination of flourescent light. You must remember that with glass sides and a glass top, heat will be trapped and in only a few minutes in direct sunlight the heat will cook all of your plants and animals.

If mold appears it usually indicates too much water and too little light. Therefore, the best treatment is to remove the top and let moisture escape and place the terrarium in sunlight for a short time to kill the mold.

The terrarium is an excellent tool for teaching ecology because you have a closed environment in which it is easy to observe the interaction of all the inhabitants with one another and with their own small atmosphere. It is also an excellent tool for developing a child's power of observation. Have each student observe the terrarium for a given period of time each day and record the changes from the previous day. This can develop into a contest to see who can find the most changes each day.

Ways the terrarium might be used as a classroom teaching tool:

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THE FRESH-WATER AQUARIUM IN THE CLASSROOM

By John V. Davis: Coordinator of Science and Health Education
South Bend Community School Corporation

The fresh-water aquarium can be one of the most fascinating classroom tools, but it is far too often misused. The majority of fresh-water aquria end up being little more than pretty displays, containing expensive gadgetry and have very little educational value. A fresh-water aquarium filled with colorful tropical fish, ornamental air pumps, and plastic plants can not be looked upon as a true teaching tool.

A properly constructed fresh-water aquarium is a laboratory in itself. To develop a good fresh-water aquarium the most important thing is to have the proper type of tank. If you must purchase a tank, the best values are to be found by ordering from the large catalog mail order houses or from various discount stores. For classroom use, I would recommend anywhere from a five to fifteen gallon aquarium. The size will probably be determined by the available space for it in the classroom. In picking a place to display the aquarium in the classroom you should keep in mind that it should be placed where it will be exposed to strong diffused light. It should not have direct sunlight for more than an hour each day. Too much light will encourage the growth of algae. An east or north window is usually the best place for an aquarium.

To develop a healthy aquarium, it is necessary to have a clean tank when you start. The tank should be washed thoroughly with soap and ammonia water. It must then be rinsed several times with clear water.

The next step is to wash thoroughly enough sand and/or gravel to cover the bottom of the aquarium to a depth of about two inches. After you have placed the sand and/or gravel in the aquarium you can start adding water. It is best to use pond water if it is available. If pond water is not available you may use tap water which has been standing in an open container. If the water has been chlorinated, it should be allowed to stand for at least 48 hours before it is used. If you place a piece of cardboard on the sand and pour the water slowly onto it, you will find the water will stay much clearer. Pour water in until you have 6-8 inches in depth. You are now ready to plant. At this time, you should make sure that the aquarium is placed where you expect it to stay. A filled aquarium is very heavy and moving will tend to break the seal.

I feel that the best plants to use can be found in the ponds of our area. Plants such as Cabomba, Myriophyllum, Elodea (anacharis), Sagittaria and Vallisnera will grow nicely in an aquarium. If you cannot collect the plants, you can purchase them at most tropical fish stores. I prefer the native plants because they usually have many microorganisms living in them as well as larva, snails, etc.

When planting, it is important not to over plant. Leave room for the plants to grow. Under proper conditions, aquatic plants usually grow rapidly and you may find it necessary to cut them out from time to time.

To plant the aquarium, spread the roots of the plants such as Vallisnera and Sagittaria and cover them with sand or gravel up to the crown. Most of the other plants will be stem cuttings without roots and you will have to push the stem an inch or two into the bottom material and then weight it down with a small stone. After the plants are in place, again use the cardboard and fill the aquarium to about one inch from the top.

Plants are very important to the aquarium environment. They place oxygen in the water, provide shelter or protection for small animals, absorb some of the excreta of the animals and are used as food by some organisms.

After the aquarium has been standing for a few days, you will want to add some easily observable animal life. You may want to develop the traditional type of aquarium with fish, tadpoles, snails and a turtle. I firmly believe that a better aquarium can be developed by using a collecting net and dragging it through the vegetation and along the bottom silt and mud of a local pond. You will find all kinds of interesting creatures that you may never have seen before. Most of them will be insects or insect larva and in many of them you may be able to watch transformations take place right before your eyes as they pass through the stages toward adulthood. With one or two inexpensive guide books on the immature insect, you will probably be able to identify most of your new found friends.

The aquarium is another good instrument for developing in students the powers of observation. A hand lens should be available at all times for the students to use in observing the smaller organisms in the aquarium. I would suggest that the students keep a log of their observations. Each student might be assigned a particular organism to observe and that student might be encouraged to draw illustrations of what they observe.

You will find an aquarium is a completely different world filled with fascinating activity.

THE EARTHWORM SHOULD BE IN SCHOOL

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The earthworm is probably one of the best known animals of the entire animal kingdom. Earthworms are simple commonplace creatures to most of us and we think of them mainly in connection with fishing. Such an impression is grossly unfair.

Even though most of the earthworms that live in our area are relatively small, they play a major role in our ecology. Without earthworms, our planet would be a very different place.

The earthworm is easy to procure, inexpensive, easy to feed and raise, and fascinating to observe. Earthworms can be obtained by turning over any soil rich in organic matter, i.e., garden soil, top soil in a forest, barnyard, etc. If you purchase earthworms, they are not particularly expensive at fish bait stores. You will, however, find them more expensive if you purchase them from a biological supply house.

A dozen earthworms can easily be kept in a gallon jar. I recommend a jar because this enables observation as the earthworms work along the sides. Earthworms feed on decaying organic material. They particularly like decaying leaves and coffee grounds. To set up your colony of earthworms, I would suggest you fill a gallon jar about two-thirds full of rich organic soil from a garden or woods. Place several decaying leaves on top of the soil and sprinkle in a tablespoon of coffee grounds. The mouth of the jar should be covered with a screen or net so that the worms cannot get out, but the air may circulate. Weekly you should add another tablespoon of coffee grounds, an apple or potato peel, and a small amount of moisture. Keep in mind that earthworms will drown if the soil is saturated with water.

Earthworm observations that may be made in the classroom:

1. ***When do earthworms feed?*** *After close observation for several days the student will notice that things happen in the colony at night. Leaves and coffee grounds will be moved at night and some things may disappear as they are eaten or carried beneath the surface to be eaten at a later time.*

2. ***How can an earthworm change shape?*** *Have the students wet their hands (to protect the mucous on the worm's body) and place an earthworm over the edge of their hands. Notice how it can stretch. Place the worm in the palm of the hand and notice how it will pull itself back together (shorten). The students may have observed how the worm stretches when a bird is trying to pull it from its burrow. See if the students can come up with any ideas as to why the worm can stretch this way. The answer, or course, is in the earthworm's most obvious feature, the rings (segments). Each segment is joined to the next segment with a soft membrane material that has the ability to stretch. The students may liken this to the slinky toy that is familiar to them.*

3. *__Where is the earthworm's mouth?__ The students will observe that there are no eyes, ears, or nose. After a period of observation they should note that the animal tends to feed at the pointed end; that there is a mouth on the underside of the pointed end. Also, the earthworm usually moves with the pointed end leading the way. The head end is pointed while the tail end tends to be flattened and blunt.*

4. *__Why does it tickle when an earthworm crawls across the palm of your hand?__ Why does a bird have such a struggle pulling an earthworm from its burrow? Have the students wet their hands and place a worm on their palm; it will tickle as it crawls. If they turn the worm over and use a hand lens they will see that it has two pairs of little bristles on each ring or segment. These bristles are what tickle when the worm crawls on the hand. They are also used as anchors to hook into the soil when a bird tries to pull an earthworm from its burrow.*

5. *__Can an earthworm smell?__ Place an earthworm on a wet paper towel. Dip a small piece of toweling or cotton into vinegar. Move the toweling or cotton with vinegar toward the head of the earthworm. __Do not touch the worm.__ How does the worm react? Move it toward the tail. How does it react? Use other liquids on the toweling or cotton. Do you get reactions? You can observe that the earthworm is aware of many different chemicals in its surroundings. The earthworm does not have a nose to smell, but it does have receptors all over its body that can sense chemical changes in its environment.*

6. *__Can an earthworm see?__ Place the worm on a wet paper towel. Place another wet towel so that it lightly covers about one-half of the worm. Put a lighted bulb or a flashlight about one foot from the worm. How does the worm react? Do you think it has receptors for light?*

7. *__Can an earthworm climb?__ Place an earthworm on a wet paper towel. Hold the towel up at various angles. Will the worm climb? Use a smooth surface such as metal or glass. Can the worm climb a smooth surface? You will find the worm is capable of climbing a smooth surface at almost a 90° angle. This is possible because of tiny pores in the surface of the glass or metal. The earthworm inserts its bristles in the pores and the mucous on the worm's body acts as an adhesive.*

8. *__What is the big ring found on some of the earthworms?__ If the students will observe the worms with rings for a period of time they will find that the ring is not always in the same position, and after a time it will disappear. It slides off over the head of the animal. The ring forms a cocoon which is the earthworm's method of reproduction. After the colony has been working for several months you might sift through the soil to see if you can find some cocoons.*

The earthworm is of great benefit to man because it pulverizes the soil, turns the soil over, carries organic material down into the soil, its burrows assist in aeration and irrigation of the soil and it serves as food for many animals.

INSECTS IN THE CLASSROOM

By John V. Davis: Coordinator of Science and Health Education
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There are many insects whose behavior and habits make them suitable for use in the classroom. However, the use of insects is limited in most classrooms to a few minutes observing the live insect or to the placing of a cocoon or chrysalid on a shelf or in a jar with an expectation of it hatching. In this paper I will discuss how to care for and get the best results from four insects that can easily be kept in a classroom. These insects have been selected because they are easy to obtain and they can be used to demonstrate, experiment, observe and illustrate numerous biological behaviors, facts and phenomena.

*I. **Mealworms** The mealworm is probably thought of by most persons as food for laboratory animals such as frogs, toads, lizards, salamanders, fish and birds. They are also a very good animal to use with students when studying animal behavior.*

The mealworm is the larva of the black beatle found in the grain bins of farms and grain elevators. Mealworms have a shiny whitish yellow to light brown body armour much like wireworms, but they lack the many legs of the wireworm.

To develop a colony of mealworms you need a container such as a coffee can or gallon jar. Fill the container about one-half full of food for the worm colony. Biological supply houses recommend bran as the food, but I have found that oatmeal, cornmeal, or most dry cereals will work equally well. I would not recommend that you use the cereals with extremely high sugar content. Once you have the container and food, you need to purchase a few worms from a pet store. For less than a dollar you can get several dozen. Just dump them on the surface of the food in the can and watch them make themselves at home as they dig in.

Meal worms do need moisture. This can be added by placing a damp piece of newspaper or paper towel on top of the food. Be careful not to have the paper wet enough to moisten the food and cause it to mold. If you see mold appear immediately remove any material it has infected. You may also add moisture by placing an apple core, carrot or section of potato on top of the food. The container for this colony needs a cover, but the cover should not be air tight. For best results, the container should either be wrapped with a dark material or put in a dark place if it is glass.

After you have done the above, your colony is established and there is little you need to do. Add moisture every few days and put in some additional food every couple months. When the larvae and pupate become beetles you may want to remove the old shells. Likewise, after the beetles die you should remove them. For best results the colony should be kept near 80°. At this temperature it takes four to six months to complete the life cycle. If the average temperature is cooler it will simply take longer to complete the life cycle. Once the colony is well established you will find all stages of the life cycle: eggs, larva, pupa and adults. If you take care of the colony it will last for years.

*II. **Praying Mantis** The praying mantis will do well in a large terrarium or in a cage that is screened and has soil with growing vegetation. It is most interesting to start your praying mantids from an egg case (cocoon). These may be purchased from a biological supplier, but it is more fun if you can find your own egg case. They are found on shrubs and can often be found in great numbers in hedge rows.*

Place the egg case in a terrarium or cage. The reason for soil in the terrarium or cage is to keep the egg case moist and vegetation is necessary for the young emerging animals to climb. After the egg case is placed in the container, it should be placed in a warm, not hot, location until the young start to emerge. The mantid egg case is many chambered and you may have over one hundred young hatch. As the young start to hatch, be careful that no direct sunlight strikes the cage. This is very important for it prevents the rapid drying of the casts which are left by the mantids when they moult. If the cage is too dry or the animals are in direct sunlight, the cast may become dry before it is shed, causing death of the insect.

Young mantids are carnivorous and cannibalistic. They will eat one another, particularly when too many of them are in a confined area. A good food for young mantids are fruit flies. As the mantids become older, they will eat almost any insect. They will need several insects to eat per day.

If you successfully hatch a mantid egg case, you will want to release most of the mantids and keep only one or two to feed and observe. This means that the best time to hatch mantids would be in late spring when it will be warm enough to release them and they will have a chance to survive.

Mantids will grow to be four or five inches in length and in nature are of great importance in controlling other insects.

*III. **Termites** Termites are very interesting because of their social organization. They can be found in most decaying logs in our area. All you need to do is to break out a sizeable piece of wood and place it in a terrarium with a tight-fitting screen cover. This type of colony needs no special food and will live for many weeks if the wood is kept moist. It would be a good idea to partially cover the wood with soil. They can then be observed as they break down the wood.*

A very interesting experience is to squash a termite on a microscope slide and place the slide under a microscope to observe the many types of protozoans that live in the intestine of the termite. These protozoans break down the cellulose eaten by the termite so that it can be digested.

IV. Butterflies and Moths - Chrysalids and Cocoons Every fall many chrysalids and cocoons are brought into the classroom. The mortality rate of these organisms is extremely high because they are not properly cared for. The insects that emerge from chrysalids or cocoons are usually large and therefore need ample space to properly develop. A screened animal cage or an old aquarium with a screen cover makes a good cage in which to rear these insects. For a single chrysalid or cocoon, a gallon jar will barely supply sufficient room. Whatever type of cage, or container, you use, it is important that it be covered with a screen and have ample ventilation. You need to also have an inch or two of moist soil in the bottom of the container so that the chrysalid or cocoon will not dry out.

Chrysalids and cocoons are easiest to collect in the fall after the leaves have fallen. The best places to look for chrysalids and cocoons are in shrubs and bushes in fence rows, plantings in yards, or on garden plants. When collecting, it is best to cut five or six inches of twig or stem of the plant to which the chrysalid or cocoon is attached.

After you have collected the chrysalids or cocoons, stick the twig or stem into the soil in the bottom of the rearing cage or container. Remember that the humidity in a classroom is usually much lower than the humidity the animal would be subjected to in its natural surroundings. Therefore, it is very important that this low humidity be compensated for by keeping the soil in the cage damp and daily hanging set strips of cloth or paper toweling in the cage.

If you follow these instructions, the chances are better than fifty-fifty that an adult butterfly or moth will emerge from the cocoon or chrysalid. When kept in the classroom, the chrysalids or cocoons will usually hatch in January, February, or March. Don't throw them away, however, if they have not emerged by March. Some species may just take longer. If you wish to slow down the emergence of the adult, place the cocoon or chrysalid in a cool room, garage, or in a properly humidified refrigerator.

The butterfly or moth that emerges will either need to be turned loose or fed. If you choose to feed, you will need to supply sugar water as food. This can be done in a very shallow container such as a jar lid. Put very little liquid in the lid. Not more than 1/16 of an inch deep. Most butterflies and moths will feed on this.

If you are planning to complete the entire life cycle, the next step becomes the most difficult. You will need to have foliage for the larva (caterpillar) to feed upon. Many larva are specific to what plants they will feed upon. Your best chance of getting a plant that the larva will feed on is to get branches from the same plant on which you found the cocoon or chrysalid. If you find the right plant, you will need to get fresh leaves every day or two for several weeks until the pupa forms a chrysalid or cocoon.

A PARTIAL LIST OF CLASSROOM ACTIVIITES THAT CAN BE DONE INVOLVING PLANTS: USING LITTLE OR NO EQUIPMENT

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This is in no way meant to be a complete list of ways to use plants in the classroom. I hope the suggestions here will bring more ideas to mind. I realize these suggestions are very brief. If you would like more information on how to set up, or what is involved in any of these activities, please feel free to call me at (219) 282-4057, or write to me at 635 South Main Street, South Bend, IN 46601. I will be glad to discuss any questions or problems you might have concerning these activities.

In this list, you will find some activities that can be used with Kindergarten students and some that may be used with eighth grade students. Some activities might be used at all levels, K-8, just by increasing the sophistication of the activity at each grade level.

Some Ideas to Coordinate Plant Study with Other Subject Areas:

ART

Draw plants or plant parts. Develop a color wheel using plant life. Collect as many different colors of fall leaves as possible. Collect as many different shaped leaves as possible. Develop fabric patterns from patterns of nature. Look at spring leaves and try to predict fall colors.

LANGUAGE ARTS

Write a story about your favorite plant. Describe a plant orally or in writing. Write a story about the beauty of nature. Write a poem about a plant or nature. Make a collection of stories or poems about plants or that refer to plants.

MATHEMATICS

Develop practical problems using classroom plants. Determine leaf surface and stem surface area. Graph weight gains. Graph growth patterns. Measure root lengths. Develop ratios between leaf surface and stem surface. Determine percentage weight gains within given time periods.

SOCIAL STUDIES

Make tree ring counts; if possible, bring into the classroom a slice of a tree trunk. Make a count and then mark the ring of years when important local or national happenings took place. Make a list of ways man uses plants. Make a list of all products that may be developed from a particular plant. Make a list of plants that play a role in the economy of our county, state, or country.

MUSIC

Conduct an experiment on what effect various types of music has on different types of plants.

HEALTH

Study the nutritional value of plants. Tasting parties of food plants, use both fruits and vegetables.

SCIENCE

Observe the complete life cycle of a plant during the school year. A green bean is an excellent plant for this study.

Let each student or team of students care for a plant and learn to appreciate their needs and observe their responses to the care they receive.

Compare leaf scars, lenticels, and buds from the twigs of several different trees. Students should realize this is a more accurate method of tree identification than leaves.

Make leaf collections. Identify simple, compound pinnate, compound palmate, or double compound leaves. Collect single specimens from different trees of the same species to show variations. The tulip tree is excellent for this.

Learn to identify the various parts of a flower. Students should realize all flowers do not have all parts. Some of the showiest flowers have no petals.

Plant seeds in a weighed amount of dry soil. Water seeds and care for the plant that grows for a given period of time. Remove plant, dry soil, and weigh it. Have students figure out where weight of the plant came from.

Demonstrate water cycle.

Demonstrate carbon cycle.

Observe plants' responses to various controlled conditions such as: moisture, soil types, light, and temperature.

Time various plants as to how long it takes them to turn leaves toward the sun, to straighten after having been allowed to grow on their sides, etc.

Set up transpiration demonstration.

Demonstrate transfer of water from roots up to stem and leaves.

Have students closely examine various plants with hand lens. List things observed that cannot be seen with naked eye.

Experiment as to the effects of light, water, and temperature on the germination of various seeds.

Observe and make a list of various animals. Include insects, etc., that eat plants and list the plants they are observed eating.

Reproduce plants by various methods: seeds, leaf cuttings, stem cuttings, root cuttings, bulbs, corms, layering, and stolons.

Collect oxygen from aquarium plants.

Use microscope to observe leaf hairs, stomates, cells of water plants, cells of onion skin, carrot cells, etc.

Demonstrate tropisms.

Grow ferns from spores.

Grow moss to show life cycle.

Observe a tree on the playground or near the school. Determine its relationship to other plants, animals, rain, snow, ice, temperature, wind, etc.

Test the cooling effects of trees.

Grow and observe various molds.

Grow and observe yeast.

LIVING LEAVES HAVE CLASSROOM USES

By John V. Davis: Coordinator of Science and Health Education
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Most students and adults know that nearly all green plants have leaves; that the leaves contain chlorophyll; and that in some way the chlorophyll produces food for the plant. In the following material, you will find a variety of activities. Some can be used with lower elementary students, and others will be suitable for upper elementary students.

About the only certainty in science education is that at some time during upper elementary or junior high school years, the student will be asked to make a leaf collection. Unfortunately most teachers never capitalize on this activity, and the student ends up learning to use the leaf only to identify the tree, shrub, or vine. Ironically, the leaf is not the best way to identify a plant.

Here are some things that may be done in the classroom using leaves:

1. *Using plants in the classroom or plants found on the school grounds, have the students use a hand lens to examine a variety of leaves. They will be most surprised to find features they were not aware of, such as: ridges, unnoticed serrations (indentations), hairs, tiny insects, etc. These observations can all be made without removing the leaf from the plant .*

2. *Plant a strawberry plant in a clay flower pot and let it have several days to become established. Saturate the soil with water and then place a glass jar over the plant. You will find that droplets of water will form along the margin of the leaf. Plant corn seed and let the seedlings grow to two or three in inches; then place a jar over them. You will find that a droplet of water will form at the tip of each leaf. This phenomenon of droplets forming is called guttation.*

   You can have the students try to develop theories as to why the drops of water form. You may want to remove the glass jar and the droplets will disappear. Have the students figure out where the water goes. Replace the glass jar and see if the droplets reappear in the same place. After they have developed theories about how the droplets form, you might want to use a microscope along the edge of the leaf where a droplet formed. You will find that there is a water stoma (an opening that never closes) at this point. A plant leaf has a continual loss of water. This water is normally evaporated into the air, but when the jar is placed over the plant the humidity will rise, in the closed environment, to a point where the water will no longer evaporate and the droplets form. These droplets are often mistaken for dew on warm humid spring and summer mornings.

3. *During the fall of the year you may have noticed that the leaves of several plants, that normally have dark green foliage, take on a fuzzy grayish-green appearance. This happens particularly to phlox, roses, and lilacs as well as many garden plants. If these leaves are observed under a stereoscope or hand lens, you will find there is a fungi grown on the leaves. This is a mildew.*

4. Using a low power microscope, there are several interesting observations that can be made using leaves.

A. Using a pair of tweezers, remove a leaf from an Elodia plant (anacharis). Place the leaf on a microscope slide in a drop of water and view under a low power or glass bead microscope or microprojector. The reason for using tweezers is that the sweat on your hands contains salt and this will kill the cells in the leaf.

The students will be astounded by what they see. If they are viewing the edge of the leaf, they will first spot the large pointed, hollow cells. These are called spur cells and give the edge of the leaf a saw-like appearance. These leaves are only two cell layers thick. Therefore, it is easy to focus the microscope through them. When the microscope or microprojector is focused, the student will note that the cells are arranged much as bricks in a wall. The student will also note that chloroplasts are moving in the cells. Have them watch these movements for a period of time. A sharp student will realize that in one cell the chloroplasts are moving clockwise and in the adjacent cell they will be moving counter-clockwise. Some student is sure to find microscopic animals attached to their leaf.

B. Remove a leaf from a geranium plant and, using a razor blade, scrape or peel the transparent layer from the underside of the leaf. This layer is known as the cutin. Place this on a microscope slide in a drop of water and then view it under the microscope or microprojector. The student will see several interesting things. They should observe the jig saw like pattern with which the transparent cells of the cutin fit together. They will also spot the many thick walled kidney bean shaped cells that are found in pairs and form the openings called stoma through which there is an exchange of gases between the cells inside the leaf and the environment. They will also note the hairs on the underside of the leaf.

CONCERNS AND PRECAUTIONS WHEN USING VERTEBRATE ANIMALS IN THE CLASSROOM

By John V. Davis: Coordinator of Science and Health Education
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When referring to using animals in the classroom, the majority of persons are thinking of vertebrate animals. We should, however, remember that in many situations invertebrate animals are more versatile for classroom use and much easier to give proper care. Many invertebrates can be successfully raised in the classroom. In this paper I will deal only with vertebrate animals.

The use of animals should be regarded as a vital and integral part of any general science or biology course. The aim of studies that involve animals should be to achieve an understanding of the creatures with whom we share our environment, and to encourage students to develop an interest in the infinite wonders of life processes. At the same time, the students must learn responsibilities for the humane care and treatment of animals.

First hand study of living things under qualified supervision, tends to deepen a student's understanding of life and its process to a degree that cannot be achieved through textbooks alone. Because of irresponsible mishandling, abuse, and cruelty to animals in some classrooms, pressure groups have developed which have not only taken offenders to court, but are also advocating the passage of laws by our state legislatures and by Congress, which would go so far as to prohibit the dissection of earthworms and grasshoppers in our classrooms and laboratories. It behooves us as teachers to use great care in protecting the students and the animals so that no incidents arise that might be open to criticism. This means that each teacher must understand procedures to be followed in using live vertebrate animals in the classroom.

The following precautions in regard to using live vertebrate animals in the classroom have been developed for the protection of the classroom teacher, the student, and the animals:

GENERAL PRECAUTIONS

1. No vertebrate animals should be permitted in the classroom without advance permission or request from the teacher. The teacher should clear his or her request or permission with the principal or department chairman.

2. An animal should not be kept in a classroom if it will in any way endanger the physical or emotional welfare of any student, i.e. allergies or psychological fear.

3. Mammals brought into the classroom should have written proof of rabies shots. Exceptions would be animals brought in by the zoo or by a veterinarian, or small animals as gerbils, mice, etc. that have been purchased at a pet store.

4. Wild mammals should not be admitted to the classroom until they have had rabies shots, undergone a quarantine period and the person who has the animal has a valid permit.

5. No bats, live or dead (unless in preservative), should be allowed in a classroom. Bats are latent carriers of rabies.

6. A teacher should not permit an animal in the classroom unless proper housing, feeding, bedding, and care is available. Proper housing would mean cages that can be securely hooked and in the case of animals that gnaw, the cage must be made of metal.

7. Animals should not be removed from cages and handled unless under the direct supervision of the teacher.

8. Students should use proper hygiene practices of washing hands after handling any animal. This includes: mammals, birds, reptiles, and amphibians.

9. Turtles should be brought into a classroom only under very close supervision. They should never be handled by students. Turtles transmit a very serious disease: Salmonella. Therefore, it is very important that anyone who handles them should very thoroughly wash their hands. Students should be made aware of this fact, as they often hunt turtles to keep as pets at home.

10. Birds are not good animals for the classroom. It is difficult to keep the proper temperature for them. They also are prone to having lice and mites as well as diseases that can be transmitted to students.

11. Any injuries, (bites, cuts, or scratches), should be reported to school authorities and treated by a nurse or doctor.

12. If any warm blooded animal dies in the classroom, do not destroy or dispose of it until circumstances surrounding its death have been determined to be normal by a veterinarian or medical person.

13. Animals should not be kept in classrooms over vacations unless adequate housing is provided and a qualified caretaker is assigned specific duties of care and feeding.

14. Live animals may be taken home by students only when authorized by school authorities with written consent of parents. Such written consent will indicate assurance that no dissection experiments will be performed on the animal, that accommodations for the feeding and care of the animal are available, and that the animal will receive humane treatment.

EXPERIMENTAL PRECAUTIONS

1. Experiments on live animals should be performed only as part of a program of science study by the pupil under the direction of a qualified science teacher or research scientist. No dissection experiments should be performed on live animals.

2. Experiments that involve the use of anesthetic drugs, surgical procedures, pathogenic organisms, toxicological products, carcinogens or radiation should not be performed on live animals.

3. The comfort of an animal used in any experiment or study must be of prime concern to the student. Proper handling, feeding, and sanitation must be strictly observed at all times.

4. Experiments in nutrition deficiency should be carried only to the point where symptoms of deficiencies appear. Appropriate measures should be taken to promptly correct the conditions. In cases where this cannot be done, the animal must be destroyed by humane methods by a qualified science teacher, research scientist or laboratory technician.

5. If frogs are used for reflex experiments, they must be prepared by a qualified teacher or laboratory technician either by pithing or by use of anesthetics.

DISSECTION PRECAUTIONS

1. All animals used for dissection purposes must be lawfully acquired in accordance with state and local laws.

2. Dissections of animals will be done only with proper equipment and under the direct supervision of a qualified teacher.

The foregoing precautions should apply equally to all science projects and contests in which live animals are used.

SCIENCE/LITERATURE

Reading books that have been reviewed

and

science activities to be used with them

Book Title ______________________________

Author(s) ______________________________

Science Area(s) ______________________________

Suggested grade or grades to be used ________________

WORKSHEET

Science/Literature Workshops

February 11 and February 18, 1986

Book Title Birds in the Sky

Author L & J Hawkinson

Members of Work Team Jane Frucci, Ruth Little, Mary Peters, and Ann Gundlach

Activities:

1. Field trip to school grounds or surrounding area:

   To note the different bird habitats. If done in winter, you may want to put out a bird feeder to bring birds near observation area. Should be put out in fall and follwoed through the summer.

   Note characteristics and possible changing characteristics of birds.

   If done in spring or fall - note leaves and insects too.

2. If existing nests are available, (discourage children from collecting nests), study building materials, size, sites where found.

   Invite a naturalist into the classroom to bring nests.

   Name is Mike Champaign from Fernwood Nature Center, Buchanan, Michigan 683-8653.

   As a follow-up, nests can be made of a shredded wheat recipe, which can be filled with jelly beans and eaten. (For recipe call Ruth Little - 256-0774).

Consultant Workshop: Carol M. Butzow and John W. Butzow

Using Fictional Children's Literature to Teach Elementary Science Concepts
MODEL: Working with Ants Don't Get Sunday Off, Penny Pollack

In this book, for example, students can learn about the body structure of the ant. To achieve this learning they should be given opportunities to observe ants and their movements. Then, using pipe cleaners and/or modeling clay, they can make their own ant models. The activity culminates with a brief story writing experience in which youngsters describe how their model moves.

Numerous other possibilities exist for follow-up work:

1. Find an ant hill and observe trails to see which kind of food they seek.
2. Explore one aspect of how ants get food back to their home.
3. Observe ants moving on a tray on the overhead to see how they react and move; make a list of action words to describe this.
4. Make up a language experience story about the ants.
5. Create a newspaper published by the ant colony which reports on the great rainstorm.
6. Observe ants with hand lenses or insect boxes, then build ant "bodies" with pipe cleaners or modeling clay.
7. Play Cootie and learn the parts of the ant's body.
8. Have a snack outside and see what attracts ants.
9. See how far an ant can walk in a minute.
10. Since ants carry huge loads, see if children can carry someone larger than themselves.
11. Keep an ant colony in the room and study it.
12. Put various foods on a tray with ants and see which attracts them--be sure to include the four basic tastes--sweet, sour, bitter, salt.
13. Read other books on ants or have them available for parental reading. These students may wish to give a short talk on any additional facts they have learned.
14. Be an ant for a few days and keep a journal--individually or as a class project.
15. Do an "ant interview." One child dresses in an ant costume while the reporter interviews him as a review for the unit. Questions and answers could be made up ahead by groups of children.
16. Learn some songs about ants from the music teacher. Are they correct or just silly?
17. Compare this book to one on a similar topic; for example, Anasi the Spider by Gerald McDermott, Holt, Rinehart, Winston, 1975.
18. Add and substract numbers of ants for math; make up word problems involving ants.
19. Ask a parent or teacher aide to help a student find out if ants work for or against man's environment: are they disease bearing or able to inflict harm to humans?
20. Compare the picture of the ant colony tunnels to the child's own house or neighborhood.

Project
M.A.S.T.E.R

Using the Zoo as a Classroom

Exploiting the excellent resources of the Potawatomi Zoo and its educational director, Ben Miller, we brought teachers in for their own "safari" experiences, designed not only to acquaint them with the zoo as a facility, but to discuss how to turn a passive experience into a meaningful elementary school classroom activity. Miller's materials, included here, are adaptable for any community school district. Every participating elementary school in St. Joseph County also received a zoo "kit" full of exciting materials to enable young people and their teachers to explore the animal kingdom. A description of that kit and suggestions for ways to use it are included.

The Zoo as a Tool for Science Education

Zoos are among the most valuable and under-utilized resources for teaching science currently available to teachers. The purpose of this paper is to establish the benefits of zoo-based science education, and to provide practical ideas for integrating zoo science into multi-disciplinary lesson plans.

* * *

To prepare children for a world increasingly dependent on science and technology, teachers must introduce them to basic science concepts at a very early stage in their education. For many elementary school teachers, the growing responsibility for teaching science presents a dilemma. Although teachers want to fulfill their responsibilities, many feel that their training has prepared them inadequately for teaching science.

In order to bridge the gap between minimal training and responsible teaching, teachers need access to excellent resources. A valuable resource cannot replace thorough training, but it can help a determined teacher to develop an effective approach to an unfamiliar topic.

The value of a resource should be determined on the basis of its appeal to students, accessibility , ease of use, and, most important, effectiveness for accomplishing its purpose. To be most useful, the resource should also be designed with the needs of teachers in mind. Based on all these criteria, the zoo stands out as an extraordinary resource for teaching science.

Education is a prime directive of all good zoos. Most zoos have paid educators whose job is to increase the zoo's educational value and impact. Zoo educators respect the needs of teachers, and the benefits of zoo/school cooperation. While zoo educators work to effectively interpret the zoo and its animals for all visitors, they have a special sensitivity to school groups trying to get the most out of the zoo experience.

Zoo educators accomplish their goals by writing informational graphics, preparing activity sheets, offering special presentations, and in other ways making the zoo and its animals understandable to those who wish to learn. Teachers who take advantage of the zoo's educational programs and materials will find it much easier to plan and conduct effective zoo lessons.

At the elementary level, the the two most important goals for science education are:

1. To stimulate student interest in science
2. To help students understand the scientific method

To appreciate the value of the zoo in achieving these goals, it is important to make a distinction between an interest in animals and an interest in science. Clearly, the zoo is an extraordinarily diverse and uniquely stimulating environment in which to learn about animals. However, animal facts are not science.

Scientific investigation is a method for solving the mysteries of nature, and facts are the solutions. The goal in a science lesson should be to develop interest in and understanding of the process of scientific investigation, and secondarily to provide the facts which relate the process to the real world.

An ideal science resource should help students learn how to formulate questions, provide means of perfecting the skills of observation, and lead students to accurate analysis of their observations. The zoo accomplishes all these objectives.

Few experiences stimulate a child's curiosity and imagination as much as a trip to the zoo; and curiosity is the basis of all scientific investigation, because it provides the motivation to ask questions. But curiosity alone is not enough to make an investigation. As anyone who has visited the zoo with a child knows, unbridled curiosity can result in a flood of excited, but unorganized questions. Scientists learn to use their curiosity and imagination to come up with interesting questions, and to ask their questions in an orderly way.

What kinds of questions can the zoo stimulate, and how can the teacher help students organize those questions productively? Two general categories of questions should be considered: 1.) Questions which can be answered by observing the animals and facilities of the zoo, and 2) Questions which can be answered by reference to graphics or other information sources.

Observing animals and reading graphics and printed materials provide very different kinds of information. Observations inform the observer about how an animal acts and how it relates to its surroundings. Graphics provide the best information available about the animal's common name, range in the wild, wild and zoo diet, and natural habitat. Graphics also highlight some selected characteristic about the animal which the zoo feels is especially important or frequently misunderstood.'

Any information which is found on a zoo sign can also be found in a library book or other information source. While the presence of the animal increases the impact of the information, the most important questions which students should be asking at the zoo should be questions which they can answer by observing the animals.

The zoo provides too many stimuli to take in at once, so teachers need to prepare students by helping them decide what specific observations they should make. For taxonomic (classification) observations, students are usually told to look for details such as hair, gills, scales, or other physical characteristics. At the the simplest level, pupils simply find a number of animals which fit a certain group or groups. These observations are valuable, but they essentially serve to reinforce only what the students already know: reptiles are scaly, birds are feathered, mammals are hairy, etc.

A much more valuable observation activity which can be done at every grade level is observation of animal behavior. If people were interested primarily in physical characteristics, they would visit museums, where stuffed animals can be observed at close range, and where they stand still long enough for observers to get a good look. Museum animals do not sleep out of sight, hide in their dens, or otherwise make life difficult for the observer.

The technique of making accurate observations is one of the best science lessons the zoo can teach. To minimize frustration while carrying out worthwhile oservations, students need to be told how to observe animals properly.

PREPARING A ZOO LESSON PLAN

I. Introduction - The importance of preparation

II. Understanding the student

- A. The appeal of animals
    - 1. Beauty
    - 2. Danger
    - 3. Oddities
    - 4. Comparison with self
- B. Preconceptions
    - 1. Superstitions, myths, legends, folk tales
    - 2. Misinformation
    - 3. Expected lessons
        - a. What animals eat
        - b. Where they live
        - c. Which are dangerous

III. Understanding the zoo

- A. Layout
    - 1. The continental theme
    - 2. Other schemes
        - a. Learning center
        - b. Barn
        - c. Predator area
    - 3. The Master Plan
    - 4. Essential facilities
        - a. First Aid
        - b. Bathrooms
        - c. Drinking fountains

III. (cont.)

- B. Exhibit design
  - 1. Animal needs
    - a. Physical needs
      - 1.1 Heat
      - 1.2 Light
      - 1.3 Water
      - 1.4 Shelter
      - 1.5 Substrate
    - b. Psychological needs
      - 1.1 Social context
      - 1.2 Proximity to humans
      - 1.3 Ability to hide
      - 1.4 Conduciveness to normal behaviour
  - 2. Human needs
    - a. ease of viewing
    - b. safety
    - c. comfort

IV. Understanding the animals

- A. Classification
  - 1. Evolutionary history
  - 2. Anatomy
  - 3. Physiology
  - 4. Ability to interbreed
- B. Physical features
  - 1. Size
  - 2. Shape
  - 3. Color
  - 4. Body covering

IV. (cont.)

- C. Behaviour
  - 1. Basic motivating forces
    - a. Food getting
    - b. Territory acquisition and defense
    - c. Avoidance of predators
    - d. Social hierarchy
    - e. Reproduction
  - 2. Physical features - form follows function
  - 3. Changes forced by captivity
  - 4. Signal behaviours - using behaviour as a guide to evaluating animal health

V. Choosing your focus

- A. Physical characteristics
- B. Exhibit design
- C. Behaviour

VI. Designing activities

- A. Word searches
- B. Animal illustrations
- C. Write a question
- D. Behaviour journal
- E. Walk like the animals
- F. Talk like the animals
- G. Animal olympics

WILDLIFE CONSERVATION
THE ROLE OF ZOOS

On June 6, 1986, a female Andean condor hatched at Potawatomi Zoo. Unlike most zoo babies, whose very birth might be watched by a fascinated crowd of visitors, the condor hatched in the quiet seclusion of a private incubator, far from the public eye, and removed from her own parents. These and other important differences reveal a story of shifting roles for modern zoos.

The story begins with the loan of two adult condors from Lincoln Park Zoo in Chicago. Loans and trades have become the most common means of acquiring animals, since many diminished wild populations cannot tolerate further pressure from collectors. However, the condor loan was unusual. The adults came to Potawatomi Zoo for breeding, but not for display.

Display of exotic animals was, and still is, the zoo activity which draws the most public interest and support. While the birth of zoo babies was always a sign of good animal care, and cause for increased public attention, breeding took a secondary role behind display.

However, as scientists have documented the increasingly troubled status of wildlife, zoos have realized the need for shifting priorities. A growing appreciation for the unique benefits of captive propagation is forcing zoos to reevaluate how they allocate limited resources. Rather than choosing animals exclusively for their display value, zoos are deciding which animals will benefit most from conservation through captive management.

Although the criteria for choosing worthy animals is often hotly debated, endangered species are generally considered the most important beneficiaries of zoo conservation efforts. In addition to critically important public education, breeding endangered species is the most desirable goal of the modern zoo professional.

When a breeding pair of endangered Andean condors became available to Potawatomi Zoo, they represented an exciting challenge. Of fifteen U.S. zoos possessing Andean condors in 1985, only four successfully hatched young: San Diego Zoo, Oklahoma City Zoo, Cheyenne Mountain Zoo and San Antonio Zoo. Our zoo possessed the facilities, resources and dedicated staff necessary to join that elite group.

The condors came to the zoo in September, 1985. The male arrived with a deformed leg and a noticeable limp, reminders of a close call with hunters in the wild. Only 2000 Andean condors survive in the wild. This number might not seem alarming, until one realizes they are spread over 5000 miles of South America's Andes mountains. The wild population continues to suffer from habitat loss, hunting, and killings for tribal rituals.

In April, seven months after coming to the zoo, the female laid an egg. The egg was immediately removed to avoid breakage by the lame father. Artificial incubation improved the chances of hatching, because condors have proved to be less than ideal parents in captivity. Removing the egg also held the promise of stimulating the female to lay again.

Once safe in the incubator, the egg was regularly checked for development, turned, and protected from temperature and humidity changes. Experience at other zoos provided a guide to success.

Fifty-eight days after being laid, the chick finished a grueling 76 hour struggle to break free of its egg. The hatching put a rewarding end to early uncertainty, and began the anxious months of hand-rearing.

During the six to nine months in the nest, a young wild condor learns to recognize and communicate with others of its own kind, and perfect the feeding behaviour it will use with its own young. For long term breeding success, such as in the SSP (Species Survival Program for endangered species), captive individuals require the same opportunity to develop their instinctive behaviours. Hand-rearing presents many challenges to this process.

It has been shown that during their impressionable early months, young birds will readily imprint on humans, identifying their caretakers as parents. This process is so powerful that adult birds imprinted on humans will court people rather than members of their own species. Imprinting requires very little contact.

To avoid imprinting, our young condor was kept away from public view, isolated in a brood box simulating an actual nest. Windows for keeper observation are mirrored. Looking out, the young condor sees only her own bald-headed, wrinkly-necked, down-covered reflection.

Simulating natural feeding presents a trickier challenge. Like many birds, young condors grab regurgitated, partially digested food from the throats of their parents. The food is simulated by mixing ground meats with special enzymatic pills, designed to help people with digestion problems. The food is presented in the throat of a realistically reproduced condor puppet "Mom". A male condor puppet, like "Mom" reproduced from the neck upward, often sits in the brooder box, keeping an eye on junior. The wonderful puppets, essential to the zoo's condor breeding program, were commissioned from Genevieve Engman, the the creator of the puppets for the well known condor project at the San Diego Zoo. The puppets were paid for by donations from the "No Strings Attached" puppeteers, and the South Bend Audubon Society.

Despite the need for careful control of the condor's environment, the zoo wished to allow public involvement in its exciting program. This was made possible through the loan of video epuipment and services by the Indiana University at South Bend office of Instructional Media Services. Interested visitors may watch regularly updated videotapes of the condor chick.

The recent success of Potawatomi Zoo's condor project exemplifies the most professional approach to zoo management, acknowledging both a commitment to the special needs of vanishing wildlife and to the public that supports our efforts. We look forward to our condors becoming an important conservation success story, and our experience helping others to succeed in the same effort.

RING-TAILED LEMUR
A MODEL EXHIBIT

The Ring-tailed lemurs are often the first animals that visitors see at Potawatomi Zoo. They draw a lot of attention because they are active, attractive, and easy to observe. Judged on the basis of long-term animal health, public popularity, and educational value, the lemur exhibit is highly successful. For these and other reasons, the lemur display provides an excellent example of what to look for in every zoo exhibit.

The lemurs are located in the Learning Center, a building attached to the main entrance. Visitors who might miss the building entrance are often drawn in by the lemurs, whose large exhibit window gives a tantalizing hint of the view available inside.

Once inside the building, visitors find a large area providing comfortable viewing by many people. A short wall surrounding an indoor flower bed allows visitors to rest while enjoying the lemurs. Many people linger in this area, comfortable enough to patiently watch the wide variety of lemur behaviours.

Between the viewing area and the lemurs is a barrier of glass. The design of the exhibit barrier, which keeps animals in and people out, depends on considerations of animal and human health, space, ease of maintenance, cost, and aesthetic qualities. Glass provides excellent viewing at an intimate distance, and it is much more durable than most people think. Glass also helps confine odors. However, glass requires daily cleaning, and it restricts sounds, which are often an intriguing part of an animal's appeal. In other exhibits, different conditions may require the use of wet or dry moats, wire fabric, or other barriers, each with its own advantages and disadvantages.

Behind the glass, the lemurs jump, sleep, eat, play, fight and groom in a thoughtfully designed artificial habitat. Diffused light shines down from a skylight, and direct sun streams in a window. Natural light can be important to animals for the production of certain vitamins, and the control of skin problems. Daylight is augmented by timer controlled artificial lights.

Water flows over artificial rocks and near the base of manmade trees. Both are made of gunnite, which is a mixture of cement and sand sprayed over a prefabricated shell of metal. This material is expensive, but more importantly, it is durable, and can be sculpted and dyed to simulate a wide variety of natural materials. The flowing water stays clean for the animals who drink it, and it is attractive in the display.

Another aesthetic element, a detailed background mural, helps visitors visualize the lemurs in their natural habitat. Camouflagesd in the wall are two small doors into the exhibit. One allows human entry for cleaning and food dispensing, while the other leads to the lemur holding cage. As with most animal enclosures, keepers only enter the exhibit when the animals are confined in their holding area. The holding cage may also be used to temporarily isolate aggressive or bullied animals, to confine an animal for observation, or to give any or all the animals respite from sometimes stressful public display.

Finally, consider again the lemurs on display. From the strategically located branches on which they leap, to the natural sunlight in which they sit, the lemurs depend completely on humans for every detail of their captive conditions. The lemurs signal our successful design by their healthful vigor, natural behaviour, social cohesiveness, and and tendency to utilize their available space thoroughly. Graphics require an economy of words, and therefore can not provide most of the above information. However, it is clear that the success of exhibits depends on intelligent design, which takes into account both animal and human needs.

Project
M.A.S.T.E.R

A Teacher Science Fair

The M.A.S.T.E.R Science Fair was the first of its kind, spotlighting the original scientific exhibits designed not by students but by elementary school science teachers. We also attracted several entries from secondary school educators. Brief descriptions of each exhibit, along with lists of winners and photographs, are included as suggestions for the classroom and for similar events to be held in other communities. Higher educational consultants served as judges of this fair, and the honorary collegiate science society, Sigma λi, sponsored the grand prize. The Science Fair was viewed not only by the general public (the event was held in our civic arena, Century Center) but by teachers themselves, who exchanged ideas to use in their own classrooms.

ather Around Us
The Water Cycle

Ruth Craft
Perley Elementary School

"Caveman Machinery"

"Caveman Machinery" is an interdisciplinary science unit for use with grades 2 - 4. Three major components are integrated in the unit:

1. Creative thinking skills -- as defined by the Talents Unlimited Program, SBCSC,
2. Hands-on science investigation -- of simple machines utilizing readily available inexpensive materials,
3. Language arts -- the writing component -- as emphasized by the Bay Area Writing Project, SBCSC.

The unit is designed for use with any of these management systems:

1. Large group (teacher directed) -- grades 2 and 3
2. Small group (teacher assisted) -- grades 2, 3, and 4
3. Individualized (learning center) -- upper 3 and 4

On display will be the first three sections of the Caveman Machinery unit, the kit used by students, and a sampling of student work utilizing the lessons. Each section of the unit focuses around one kind of simple machine and includes three lessons, each emphasizing one of the three major components listed above. The three lessons are designed to be highly correlated with each other but are able to stand alone, allowing flexibility in administration.

Caveman Machinery

Phyllis Gartner
Boner School

"Incubation of Eggs"

This exhibit will consist of an incubator with chicken eggs, a homemade candler, a cage and needed equipment for caring for the baby chicks, and graphic information on the process.

The eggs will have been incubated for nine days at the time of the Science Fair. (Chicken eggs are incubated for 21 days.) They will have already been candled one of the two times needed during the incubation. However, I plan to bring some unincubated eggs for the purpose of demonstrating candling of eggs. There will be charts to show what fertile, infertile, and stale eggs look like tested by candling.

Included in the display will be a chart showing embryo development and information on the desired temperature and humidity during incubation and the care of baby chicks.

Julianna Gollings
Mary Phillips Elementary School

"Trees"

Trees (forests) have helped greatly in building our country. The lumber industry is still a big operation today. Besides commercial use, trees provide homes and protection for many wildlife in our forests, help protect soil from erosion, and provide shade and beauty to our earth. This small unit on trees has, as its objective, the task of showing first graders the importance of trees through identification of its parts and through its many uses. A close spin-off center of the tree unit is a center on leaf identification. Many books have been written about trees which even a beginning reader can enjoy. Art projects such as bark and leaf rubbings of the many different kinds of trees in our area, making leaf people and leaf animals, making leaf collages of the many leaf varieties, and dried leaf wall decorations and banners are just a few fun projects which come from trees. Adopting a tree outside your classroom window to watch during its seasonal changes and record as a class study is another project for young children. Having a class booklet made to show what each child would do with a tree is a good language experience. Snare poems about trees with your class, also.

Patricia Horner
Monroe School

"Science at Mrs. Horner's Corner"

My project is designed to aid teachers with the introduction and integration of science into their language arts curriculum.

There are many means to obtain this end including stories, poems, murals, experiments, art projects, vocabulary and sentence skills. In lower elementary projects even so simple a thing s show and tell can be utilized to implement our goal.

In order to give a broader spectrum of ideas, I have chosen to include six or seven units out of the ten used for this year. I felt that I could generate more interest this way, rather than to have chosen one unit and expanded it in great detail. I have displayed sample work done by primary students from each unit along with teacher made materials.

Units are available for educators to take for use in their own classrooms.

My goal is to promote "fear" free teaching of science, along with the "know how" to reach the student.

In the technological world of today, science is of paramount importance and our purpose should be to make it enjoyable and educational for our students.

Saraellen Johnston
Boner School

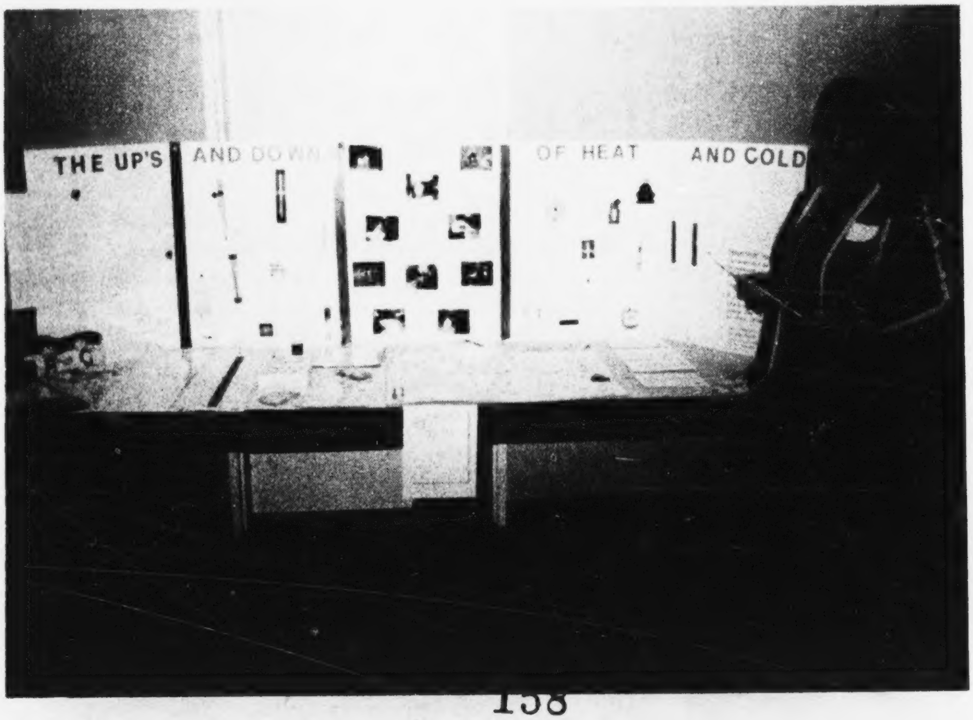
"Ups and Downs of Hot and Cold"

My project is a springboard from a Math and Science unit on using thermometers. According to our curriculum, children should be able to read a Celsius and Fahrenheit scale with 80% mastery.

The purpose of my project is to add activities, games, incentives to the basic unit. Upon completion of the unit the children will have many hands-on activities and have opportunity to develop the skill on a wider base. They will recognize how the reading of thermometers applies to many out of school situations and occupations.

Included in the unit will be teacher made:

Mix and match activity cards
Puzzles
Giant thermometer with Celsius-Fahrenheit scale
Filmstrip on hot and cold (Troll Association)
Puppet show written for Cindy Celsius and Freddy Fahrenheit
Riddle cards
Computer made word search and crossword puzzles
In class measuring activities
Practical uses of reading thermometers
  a. Making lollipops and freezer pops
At home data sheet
Unit completion award and certificate
Temperature trivia
Make your own thermometer



Pat Keever
Lincoln Elementary

"As the World Turns and Turns and Turns"

My project integrates science with the language arts. It is based on the books The Day We Saw the Sun Come Up by Alice E. Goudey and Wait Till the Moon is Full by Margaret Wise Brown.

This unit is used in a second grade class for a period of two weeks. The science concepts covered are the earth's rotation, the sun, shadows, the moon's various phases and man on the moon. Poetry will also be presented as well as creative writing projects, art ideas, math lessons, games to play and activities to do at home.

All materials necessary to teach the unit and student work will be displayed.

Yvonne Laszlo, Nona Freeman and Peggy McAllister
Studebaker School

"Integrating Science and Literature"

We intend to correlate science and language arts lessons with the following children's literature:

1. The Very Hungry Caterpillar by Eric Carle
2. In John's Back Yard by Esther Meeks
3. Mickey's Magnets by Branley and Vaughan

The Very Hungary Caterpillar will deal with science lessons relating to the life cycle of a caterpillar.

In John's Back Yard will be used as a lesson on classifying living and non-living items.

Mickey's Magnets will lead into several lessons on magnetic forces.

Living
Non-living
Integrating Science and Literature

Cathy Metcalfe
Muessel School

"Four Seasons of the Year"

This project will be an integration of science and language arts. It will involve four separate centers, one for each season. Each center will have specific activities for the child to perform that day. Activities will include the following skills: categorizing, beginning consonants, ending consonants, language experience, etc. Skills will be correlated with games, writing, and cut and paste. A description of how this center will be implemented in the classroom will also be available.

Delores Osborn
John Marshall School

"From Seeds to Plants"

Charts to accompany the Primetime WETL weekly radio science lessons for first grade have been provided for each teacher by John Davis, Science/Health Coordinator of SBCS Corporation. Our class chose to use the charts as the center of the science bulletin board throughout the school year. Radio lessons were reinforced and concepts were expanded for each unit of study.

From SEEDS to PLANTS demonstrates how our bulletin board appeared for the Spring unit on plants creating interest as well as offering independent activities to be completed by the students. The bulletin board was developed and added to as our lessons progressed. By using the chart as the center of interest, the bulletin board will be easily adapted and changed to meet the needs of the class each year without too much extra preparation by the teacher. Also, science and language arts curriculum was integrated through a unit of books on plants on display as well as all the children's original stores.

The ideas presented in "From Seeds to Plants" include the following:

Are seeds really alive?
Plants come from seeds.
What's inside a lima bean?
Purpose and parts of a plant.
Four things plants need for growth.
Things to do to "find out" more about plants.

1. Planting seeds and keeping a seed record.
2. Opening a lima bean to investigate and drawing what is observed.
3. Writing stories using vocabulary story cards.
4. Making a flip booklet about the seed story.
5. Making an embryo lima bean.
6. Writing a letter to "Peppy" telling him that seeds are alive.

Helen J. Stock
Stanley Clark School

"Human Development"

We feel that this human development program, K-8, is a timely offering of the science department, and a truly unique dimension of The Stanley Clark School. Not only are sexuality and development explored in a scientific manner, but also issues of values, ethics, attitudes and human relationships are discussed at length. The whole program has a continuing theme of teaching awareness, responsibility, sound judgment, and common sense. This course is concerned with preparing children for the world of today and tomorrow, to assist them in learning self-awareness, to respond to their individual needs and interests, and to foster the development of their sensitivity, self-esteem, and moral growth. There is an over-all course objective that is not mentioned in the course outline for each grade, and can perhaps be called our hope for the child. The San Mateo, California curriculum guide states it well: "Every human being is a person of intrinsic worth and dignity. Love and respect for others presupposes love of self. Ideally a child is building an image of self as a worthy, contributing member of society, a self who can succeed but can accept failure without being defeated."

Judy Quinn
Human Development: Kindergarten

The human development program in the kindergarten focuses on living in a family, and the warm, loving relationships between family members as well as living in a community; the balance between the needs and rights of self and those of others. Through discussion in social studies and art work (drawings of self, family, etc.,) the topics of family and feelings, work and responsibilities, the outside world as in school and community, the children have the opportunity to develop wholesome attitudes and sound ideas about family living, making friends, and being part of a community.

Jane S. Frucci
Human Development: Second Grade

The World of Living Things introduces the idea of reproduction in its most basic form in plants and animals and then goes on to discuss human reproduction and the human family. The children learn that plants and animals are all able to reproduce. They learn that reproduction in animals requires the participation of both a father and mother. The idea that both parents participate in the creation of children is expanded in terms of the human family and its special attributes. The book emphasizes that there are different kinds of human families. The value of family life is not limited to the usual model of two parents parents and two or three children. All families, regardless of makeup, can have the same feelings of love and concern for one another--those feelings that are the special mark of the human family. The World of Living Things establishes the idea that living things are able to reproduce in various ways. Simple explanation of human reproduction, presentation of the idea of male and female, and discussion of the importance of the human family.

Joan Glanders
Human Development: Third Grade

TEXT: HOW NEW LIFE BEGINS - Follett

This book elaborates on the idea of reproduction. It states that each species can reproduce only its own kind. The concept of fertilization is introduced--the joining of male and female cells in plants as well as animals. Pictures show stages in the development of a baby chicken. Distinctions between animal families and human families is discussed.

NEW THIS YEAR

It was decided that our human development program should include a section in which we help children to grow in an understanding of themselves, others, and the world. This might best be accomplished by discussing emotions and feelings. We have posters available that demonstrate each feeling. The posters and discussions cover love, friendship, sympathy, joy, wonder, thoughtfulness, curiosity, fascination, persistence, satisfaction, frustration, anger, fear, sorrow, longing, and despair. The poster is shown, a story is read, and the children supply the ending. At other times, the poster is shown and a complete story is read.

Barbara Sylvester
Human Development: Fourth Grade

TEXT: LIVING THINGS AND THEIR YOUNG

We spend approximately two weeks with this text. It explains reproduction from simple splitting of one celled organisms to the complex reproduction of mammals. Examples used are hydra, earthworm, salmon, frog, cabbage butterfly, chicken, cat, cow and human. Correct vocabulary is defined and used. Differences between human care of young and that of other animals are explained as conscious love in humans, instinct in other animals (as far as we know). This theme of family life and care of the young is correlated with the reading program through the use of three books which are read in entirety. Caddie Woodlawn, where family relationships are fully developed. Across from Indian Shore, is a children's novel about a boy struggling to accept changes in the family situation because of the father's death. The Grizzly has a philosophic background of viewing the grizzly bear as an endangered species while the plot unfold the relationship between a boy and his father on a camping trip. Several of the writing assignments for English class emphasize family life, and the first writing assignment is based on a questionnaire about the student-position in the family, jobs or family responsibility, etc. For grandparents visiting day, each student imagines himself-herself a grandparent and writes a description of a day in this role.

Helen J. Stock
Human Development: Fifth Grade

OBJECTIVES:

1. To provide information on reproduction and growth with emphasis on puberty.
2. Provide opportunities for discussing emotions.
3. Provide opportunities for discussion of interpersonal relationships.
4. Provide opportunities for discussions on self-understanding.

METHODS:

Read and discuss How We Are Born and view filmstrips and films on There's a New You Coming (boys), There's a New You Coming (girls), Growing Up on Broadway. Have students bring in photographs of themselves at an early age, and determine class average birth weights and lengths. Discussion and anonymous questionnaires on the different ways that boys and girls express emotions, and discussion time for specific qualities that we like in boys and girls our own age, and specific ways in which we can make and keep friends.

Helen J. Stock
Human Development: Sixth Grade

OBJECTIVES:

1. Provide information on growth and reproduction with emphasis on puberty.
2. Provide opportunities for discussion of emotions and constructive ways of handling emotions.
3. Provide opportunities for discussion of relationships with others.
4. Provide opportunities for discussion of conduct and the making of choices.

METHODS:

Read and discuss the meaning of puberty through the use of student text, Man and Woman, and review reproduction by means of films and filmstrips. Have girls make a list of "Hints for Boys" on clothes, cleanliness, and haircare, and have the boys make a list for girls. Discuss name-calling and put-downs and how they affect other people. Evaluation of the values of other countries in modern history, and groups within certain societies and the reasons for their actions. Discussion of conformity and non-conformity, and the concerns of parents regarding the use of drugs and alcohol.

Janice Ivkovich
Human Development: Seventh Grade

The topics covered in this three week unit include puberty, dating, self-esteem, review of anatomy of the reproductive system, menstral cycle, human sexuality and emotions, intercourse, sexually transmitted diseases, birth control, homosexuality, masturbation, pregnancy, birth and lactation.

The textbook is Love and Sex in Plain Language by Eric Johnson. Videotapes used are "Am I Normal", "Dear Diary", and "Human Reproduction". An article on dating and emotions is read and discussed in class.

Besides reading assignments, worksheets and discussion, special strategies include student interviews of each other, poster collage prepared by each student to describe themselves, and anonymous question box for "Dear Jan" sessions. Students present a group report to the class on the effects of alcohol, smoking, marijuana, or cocaine and heroin on the unborn.

Janice Ivkovich
Human Development: Eight Grade

The primary emphasis of this three week unit is on alcohol abuse and the problem of drinking and driving. Articles on all aspects of substance abuse are available in the classroom. Students read "Sean Marsee's Smokeless Death", "Women Smokers: The Risk Factor", and "Drinking and Dying on America's Highways" which is followed by class discussion. The filmstrip series "Alcohol and Teenagers" and the films "Just Along for the Ride" and "Danger Ahead: Marijuana on the Road" are viewed and discussed. Students work in small groups on a series of questions about smoking and report their views to the class.

Students are required to prepare a substance abuse poster and notebook. The notebook includes two weeks of newspaper articles concerning substance abuse like drug raids, drugs in sports, and driving while intoxicated; advertisements for tobacco or alcohol use with a comment on the effectiveness of each; and a one page essay. The topic of this year's essay was: Since alcohol, other drugs, and cigarettes are harmful to the health of an individual, should society allow the promotion of the use of such substances?

Judy Wood
Mary Phillips Elementary School

"Ecology"

As energy, its use and misuse, becomes increasingly important, schools need to take the responsibility for teaching about energy conservation and ecology in general. Elementary students can become aware of energy problems and how they can become effective conservationists.

My project is a series of learning stations to teach about the kinds of pollution, explain what pollution is, explore how pollution can be prevented, make them aware of endangered wildlife, encourage pride in a child's surroundings, encourage a child not to litter, and introduce the concept of recycling. The learning stations integrate curriculum in Science, Art, Music, Math and English.

Helen J. Stock
Stanley Clark School

"Communities/Ecology Unit"

The purpose of this unit is to investigate the food-energy relationships among plants and animals living in the same area, and that to maintain a stable ecosystem, the exchange of energy and matter must by cyclical and balanced. The food transfer and interdependence of organisms is emphasized, and producers, herbivores, carnivores, and decomposers are studied in detail. The students learn about the water cycle, oxygen-carbon dioxide cycle, the earth's atmosphere, air pollution, and its effect on ecosystems. Along with living organisms, experiments, lectures, filmstrips and films, special methods for attaining these goals are:

1. Students set up and maintain terrariums, making observations and taking notes on the growth and the interaction of plants and animals.
2. Students gather and learn how to plot data on graphs, and how to set up a community chart.
3. Observe the life cycle of plants, and the importance of flowers, their structure and function. Emphasis is also made on learning to create a scientific drawing and labeling of plant parts. Spring flowers, trees and shrubs are used for laboratory material.
4. Observe the life cycle of animals; their behavior and adaptations to certain environments.
5. Research reports (poster or a complete written report) with emphasis on physical and behavioral adaptations of organisms to certain environments. The desert, ocean ecosystem are studied in detail.

Carolyn Baldwin
Dickinson Middle School

"Environmental Litter"

This display, "Environmental Litter," was created as a result of discussions in science class about how we, as humans, may off-set the ecological balance of nature with our "environmental litter."

Having previously studied the effects of weathering and erosion on rocks and soil, the students were asked to bring in examples of matter that did not readily break down or decompose. We received an assortment of styrofoam cups, aluminum cans, plastic utensils, bread wrappers, cigarette butts, etc.

We then labeled these examples according to "scientific names," utilizing the chapter of the text book dealing with genus-species, and displayed them suspended from the stark branches of a dead tree.

Other students were then assigned to do independent research on the time it takes these materials to break down.

Janice Ivkovich
Stanley Clark School

"Entomology Unit"

The purpose of this unit is to use one phylum, with emphasis on the class insecta, to teach proper collection of organisms, taxonomy, an appreciation for the variety of life, the characteristics of life, and how man interacts with the natural world. Besides classroom demonstrations, living arthrop ods, lectures, filmstrips, and films; special strategies for achieving these goals include:

1. Each student preparing their own extensive insect collection following accepted standards for classifying to order and pinning specimens (adapted from unit by Mrs. Nancy Taylor)

2. A poster research report given orally to the class on an insect beneficial or harmful to man introducing literature citation and bibliography.

3. Caminacules taxonomy lab adapted from a lab used at St. Mary's College by Dr. Richard Jensen.

4. Dissection of the grasshopper.

5. Field trip to the United States Department of Agriculture--APHIS Lab in Niles, Michigan to learn about biological control of insects.

6. Class debate about the use of insecticides.

Paul Pedersen and Jerry Lewis
Clay Middle School

"Astronomy Unit"

The students design their story of a space flight to a distant star where there are planets similar to our own solar system.

The students must include the use of all the vocabulary words used in four chapters of their science book. The students can use science fiction, their imagination and creative skills.

The students must choose one of the media listed:

1. Written report
2. Tape recording
3. Computer
4. VCR-TV program

John Koellner
Riley High School

"The Chemistree"

OBJECTIVES:

1. To illustrate various points concerning the periodic table.
2. To have the students learn some descriptive chemistry.

The chemistree is a form of the periodic table. Each branch of the tree is made up of a length of yarn. The yarn is attached to the table at the base of the tree, and to the central truck of the tree. The trunk of the tree is composed of a piece of pipe that is threaded into a holder on the table. The leaves of the tree are composed of 10 cm by 10 cm cards made of poster board. A hole is punched in one corner of each card, and hung from the yarn using an ornament hanger. Hung in this manner each card appears to be diamond shaped. Each card represents one element.

Every student is assigned an element. The basic information presented on the card is the atomic number, in the top corner, average atomic mass, in the bottom corner, and the symbol, in the center of the card. This information is to be given on both sides of the card. The student then is to research his particular element. He is to learn where the element is found, what types of compounds it normally is found in, uses of the element, interesting reactions of the element, etc. He then is to write a two page report on his element, and to illustrate on the element card those properties of the element that he found to be the most interesting.

When the tree is assembled it illustrates the following points of the periodic table. Classification of elements into noble gases, representative, transition and inner transition element is shown by the use of four different colors, one for each of the classifications. Relationship of atomic structure to position on the periodic table is illustrated by the branches being arranged in three concentric circles. The outermost representing elements that add their last electron to the valence level, the next circle are elements (transition) that add to the energy state that is on below the valence level, and the smallest circle the elements where the last electron is two energy states below the valience level. Each branch of course represents a family of elements.

When all is prepared the students give their report on their element, and that afternoon, following the close of school we all gather in the chemistry room to assemble the chemistree. When the construction of the tree is completed we then sing the Chemistree Song.

Nevin Longenecker
John Adams High School

"A New, Simplified Process for Producing Reverse Color Text Slides"

Colorful title and graphic slides have, in the past, been very time consuming and difficult to produce. Custom made title slides, professionally produced by a photographic firm are very expensive ($10 - $35 per slide). Recently, a new type of professional reverse color title slide film has been released to the general public. With reverse color film, you can make attractive, attention getting slides with very little effort. This display will outline the procedural steps for preparing reverse color title slides and will offer suggestions about text printing and formatting.

Required Materials:

1. Kodak Vericolor Slide Film S-279

2. 35mm camera with through the lens light meter

3. Copy stand with flood lamps (3200K)

4. Multiple filters with holder (Cokin)

5. Close up lenses

6. Shutter release cable

7. Flatwork to be copies

Representative slides will be exhibited on a Telex viewer. A typical research slide lecture incorporating the use of the reverse color slides will also be exhibited. A handout describing the procedural steps involved in producing the slides will be available.

Anita C. Nash
Mishawaka High School

"Photographs in the Classroom"

What do you do with your vacation photos: put them in an album, put them in a box, leave them in the envelope and stuff them in a drawer? No. Use them with your lesson plans.

Students enjoy seeing something personal about their teachers. It makes u s seem more human. Photographs are just the thing to spark their interest.

Vacation photos in the classroom can help facilitate many types of teaching strategies. They can be used for any grade level, any discipline, for large groups or individual study.

You might fill an index card box with snapshots as a way to pick topics for writing assignments or research projects. Cut up a picture and use it for a jigsaw puzzle. Illustrate new words or just use them for decoration on that blank wall.

The expense of using the pictures has already been absorbed and there are probably hundreds of them just waiting to be used. Hopefully this exhibit will give you some ideas of ways to use them in your classroom or at least get you thinking of ideas of your own.

John Stahly
John Adams High School

"Why You are You, A Human Genetics/Geneology Project for High School Students"

Today, many teenagers know little of their family cultural and/or genetic backgrounds. This lack of knowledge is largely due to divorce, separation, adoption, never married mothers, premature deaths, family fights or parents and grandparents who may not know or care themselves. If this family heritage information is not transmitted to the next generation, it may be lost forever.

Recent scientific research has now linked such problems as birth defects, alcoholism, aging, blood diseases and allergies with our human genes. These are the same genes that have tumbled down to us through all of our ancestors, since the beginning of the human race.

By combining the student's natural interest in finding out who he is and where he came from with the new scientific research in human heredity problems, the student will gain an appreciation of his family heritage, and in turn will learn the basic laws of heredity. He will develop his language arts skills by; first, researching public and private records, then interviewing and photographing relatives, digesting the information into a written report with charts and finally by presenting his findings orally in front of the class.

Many such projects have brought students, parents, and grandparents to realize the importance of the heredity material that they pass on to their sons and daughters and have even brought lost family members together again.

Teacher Science Fair Exhibitors

Primary Division

Teacher	School	Title of Exhibit	Category
Ruth Craft	Perley Elementary	"Caveman Machinery"	Lesson Plans for Teaching Science
Phyllis Gartner	Boner School	"Incubation of Eggs"	Demonstrations and Experiments
Julianna Gollings	Mary Phillips School	"Trees"	Learning Center with Language Arts
Patricia Horner	Monroe School	"Science at Mrs. Horner's Corner"	Science Units and Projects for Lower Elementary Students
Saraellen Johnston	Boner School	"Ups and Downs of Hot and Cold"	Demonstrations and Experiments
Pat Keever	Lincoln Elementary	"As the World Turns and Turns and Turns"	Language Arts and Science
Yvonne Laszlo, Nona Freeman Peggy McAllister	Studebaker School	"Integrating Science and Literature	Language Arts and Science
Cathy Metcalfe	Muessel School	"Four Seasons of the Year"	Language Arts and Science
Delores Osborn	John Marshall School	"From Seeds to Plants"	Bulletin Board Displays
Helen J. Stock (covers K - 8)	Stanley Clark School	"Human Development"	Language Arts and Science
Pat Camren	Mary Frank School	"Weather Around Us"	Audio Visual
Judy Wood	Mary Phillips School	"Ecology"	Learning Stations

Upper Elementary Division

Teacher	School	Title of Exhibit	Category
Helen J. Stock	Stanley Clark School	"Communities/Ecosystems"	Creative Use of Outside Materials and/or Resources

Junior High Division

Teacher	School	Title of Exhibit	Category
Carolyn Baldwin	Dickinson Middle School	"Environmental Litter"	Creative Use of Outside Materials and/or Resources
Janice M. Ivkovich	Stanley Clark School	"Entomology Unit"	Creative Use of Outside Materials and/or Resources
Paul Pedersen and Jerry Lewis	Clay Middle School	"Astronomy Unit"	Audio Visual

High School Division

John Koellner	Riley High School	"The Chemistree"	Teacher Designed, Teacher Directed Student Project
Nevin E. Longnecker	John Adams High School	"A New, Simplified Process Process for Producing Reverse Color Text Slides"	Audio Visual
Anita C. Nash	Mishawaka High School	"Photographs in the Classroom"	Creative Use of Outside Materials and/or Resources
Penn High School Science Department	Penn High School	"Science Expo-An Opportunity for Everyone"	Department Activity
John Stahly	John Adams High School	"Why You are You, A Human Genetics/Geneology Project for High School Students"	Language Arts and Science
John Wibbens	Riley High School	"Audio Visual Science Lessons"	Audio Visual
Roger Berebitsky	LaSalle High School	"Teaching Sets"	Demonstration and Lesson Plan

Project
M.A.S.T.E.R

After School Science Enrichment

One way to make room for science, given the time allocations currently set out in state directives, is to offer short-term after-school workshops focused on individual skills or general exploration. Although such programs by necessity can only reach a fraction of the pupils and involve few teachers, they offer an exciting opportunity to test new models of science education, as well as giving the students the time they need to do hands-on experimentation--crucial to "doing" science. Directed by Dr. Eliot Rosen of Notre Dame, a group of M.A.S.T.E.R. teachers formed a curriculum design team to work on after-school science, an enrichment project for early grades. Their work is also included here; it will be implemented in local schools during 1986-7.

Program Description

The motivation for this project came from the apparent observation that science is unpopular with many elementary and secondary school students. This was somewhat suprising since one would think that science activities would be extremely popular. They offer the possibility of hands on experiences for children; demonstrations can be arranged to capture the imagination of students and experiments have potential "toy" appeal. Furthermore, as a scientist, I find science interesting.

One possible reason for the apparent difference in attitude of scientists and students towards science is that science and science education are so totally different. I'm sure this is an oversimplification, but most elementary school science curricula can be divided into two types. There is the traditional approach where the students learn a variety of facts that have something to do with the body of knowledge called 'science'. On the other hand there is the discovery approach in which the student makes a number of observations on some phenomenon and hopefully develops some sysnthesis.

As a scientist I find that I don't spend much time doing either of these things. Instead, I have learned a series of mental models which provide the basis for my understanding of the subjects I study. These models can be in several forms. They can be mental pictures or sets of rules describing how "things" work. Most of my work involves testing these models, examining the consequences or implications of these models or applying these models to develop new ideas or new products. When observations are inconsistent with the models then one modifies the pictures or rules so they are consistent with the things we observe. In many ways "doing" science is very much like playing a strategy game or solving a puzzle.

The syllabus is designed to develop, examine and apply models. The unit begins with an exercise where the students develop a model (a rule) concerning how one determines if an object sinks or floats in water. The following activities will use this concept to explain new observations. Some activities are designed to expand upon the original model and then use these modified concepts as a basis for new understandings. Although we will start with the rule for determining what determines if an object will sink or float, we will finish by building a thermometer, understanding what causes the wind to blow and constructing a hot air balloon. It is hoped the student will leave some of these activities with a strong sense that he or she really understands why something works. Hopefully, the student will use the models or concepts developed during the program as a basis for these explanations. I hope this sense of understanding will be rewarding and improve the students' attitude toward science.

The last point represents a major goal of the program. The excitement of science is the "Aha" when one understands something that used to be obscure. It is the satisfaction of solving a mystery, completing a puzzle or developing a strategy to realize a goal. That understanding involves developing mental pictures, rules or models to interpret the world. We hope that our students will realize a similar satisfaction by reaching an understanding of the world about them using the models they develop during this program.

EXPERIMENT 1 Sinking and Floating

Objective

The purpose of this experiment is to develop rules to determine if an object will sink or float in a liquid. In particular an object floats in a liquid if it weighs less than an equal volume of the liquid; it sinks if it is heavier.

Protocol

The child will experiment with two series of objects. Each series will consist of identical containers that are filled with different amounts of sand. Thus each object in a series will have the same volume yet have a different weight. The student will weigh each object and determine if it sinks or float by placing it in water. The student will then weigh a container filled with water. The student will be asked to reach a relationship between 1) the weight of each object relative to the weight of the container filled with water and 2) the observation if the object sinks or floats.

The second investigation involves placing the same objects in the appropriate salt water solution and determining which objects sink and float. The salt concentration will be adjusted so that one container which sinks in plain water will float in the salt water.

The thrid part of the experiment is similar to the first but involves using a series of containers of a different size.

The purpose of the experiment is to have the student make the appropriate comparison to determine if an object sinks or floats. Namely, if an object weighs more than the an equivalent volume of liquid it will sink in that liquid. If it is lighter it will float. Hopefully, the child can reach the conclusion on her own by completing the worksheet. If the student cannot then the adult should help the child reach the conclusion.

There is a complication to this experiment which we are overlooking. The plastic container has some weight and the plastic in the walls of the container contributes to the volume. However, the contribution of the container is small. Furthermore, the density of the plastic is similar to that of water. If we were to use very small objects where the container made a significant contribution to the weight and volume, it would interfere with the results.

Materials

1. 2 sets of 6 identical plastic containers. Each set of a different size
2. balance to weigh containers
3. water
4. salt

Worksheet

How much does a container filled with water weigh?

Object	1	2	3	4	5
Weight					
Does it sink or float?					
Heavier or lighter than the liquid?					

EXPERIMENT 2 CLAY BOATS

CONCEPT/OBJECTIVE

In this lesson, children investigate the possiblities of making a small lump of clay float in a container of water. They make clay shapes and fill them with paper clips and pennies to find out how much weight their boat will hold. At the conclusion of these activities, most students begin to understand that objects which sink can be reshaped and made to float.

MATERIALS

1. 5 lb oil base modeling clay (plasticene and Claycene work best)
2. backets or plastic washtubs - enough for 1 per 2 students
3. 1 roill wax paper
4. i roll paper towels
5. multi-purpose balance
6. 2 boxes large paper clips and or $3 in pennies
7. large liquid measuring container (4 cups)

VOCABULARY

sinkers- term used to describe uniform weights placed in boats

PROCEDURE

It is best for the word "boat" to come from the children. Introduce this activity as getting a piece of clay to float. Then the children will not be limited to a boat shape. Before class begins, fill buckets with lukewarm water, or fill early enough for the water to reach room temperature. Modeling clay becomes hard and flaky once it has been in cold water. Begin with a ball of clay and ask students what will happen when it is placed in water. Place the clay in water so the children can see it sink. Ask "What can I do to make it float? Do you think that you can make it float?" Give the students each about an ounce of clay and let them begin shaping. As more children are able to get their clay to float, they will probably begin calling the shapes "boats".

At this point offer the paper clips or pennies as cargo to see how many items their boat will hold. If a balance is available, keep this on hand for students to compare the weight of different boats or compare the weight of the boats with the weight of the cargo.

At the end of this experiment try the following demonstration to help explain why the clay boat floats using the concepts developed in Activity I. We will compare two aluminum cans; an intact empty aluminum can and a crushed can. Start the experiment by weighing two empty aluminum cans. They both weigh approximately 25 grams. Have the students crush one can; it will be necessary to hammer the can to make sure it is flat. Have the students determine the weight of the can and they should observe that the weight is unchanged. We now need to determine the weight of water occupying the volume of the container. Since one [illegible] we cannot estimate that weight by weighing a crushed container filled with water. In this demonstration start with a bucket with a spout. Fill the bucket to the top so the water just begins to pour from the spout. Now place the can in the water so it is just barely submerged. This will displace water which will now overflow from the spout. Catch the overflowing water and weigh it. This represents the weight of water which occupies the same volume as the can. When I tried this experiment the crushed and uncrushed cans weighed 25 grams, the water displaced by the crushed can weighed 10 grams and the weight of the water displaced by the intact can was 445 grams. Therefore the crushed can weighed more than the diplaced water; the crushed can sank. The intact can weighed less than the displaced water; it floated. Hopefully the students will see that the shape of the object can affect the volume of water displaced by the object. If we reshape the clay so it can now displace enough water such that the displaced water weighs more than the clay, then the clay floats. Hopefully, we can connect the concepts developed in the first lesson to the clay boat experiment.

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EXPERIMENT 3 Colored Solutions Part 1

Objective

In the previous activities the students examined the ability of solid objects to either sink or float in a liquid. In this exercise we examine the ability of one solution to sink below or float above another solution. Using salt we can adjust the density of different solutions. These solutions are "tagged" with food coloring so the students can identify the different solutions.

In the first activity, the students first get used to working with the food coloring and hopefully learn how to add the solutions to one another so they do not immediately mix. The second activity involves constructing an "upness/downess" chart in which the students order the solutions on the basis of which solutions floats on which other. We should ask the students to rank the solutions from highest to lowest density. These predictions can be tested in a class demonstration in which we weigh an equal volume of each solution. The students can use the concepts explored in the first lesson in this activity. Hopefully a student can predict that if solution A sinks below solution B then a given volume of A is heavier than the same volume of B.

In the third activity the students will use the "upness/downess" chart to examine the density of different materials. It should be possible to use the differences in densities between unknown substances to tell them apart. For instance, we might test two materials that appear the same but can be distinguished by their position in an "upness/downess" chart. In addition, we might try to separate a mixture of two substances on the basis of density. We could take a mixture of sand and wood shavings and separate them by the ability of the wood to float.

Materials

1. paper towels
2. plastic trays (3 1/4"x7"x1 3/4") with cover
3. 4 or more plastic tubes 1"x2 1/2"
4. 1 plastic eyedropper
5. 1 plastic mold for holding solutions

6. Food coloring red, blue, green
7. Cardboard tray
8. plastic pails for water
9. 2 parts water to 1 part food coloring
10. small plastic spoons
11 souffle' cups to hold salt
12. water

Vocabulary

1. solution
2. density

Procedure

Pass out the materials. Ask the class what would happen if you add a drop of food coloring to water? Let them experiment for a few minutes. At this time bring up that how they squeeze the dropper might make a difference.

Next ask students what they think would happen when they add salt to plain water. Let them experiment again.

Next ask if they think the food coloring will behave differently in salt water than in plain water. As they explore the question, the students will probably notice that food coloring, instead of sinking, seems to stay on top of salt water. This can be discussed and explained by the teacher which now readies the class for Experiment 2.

Colored Solutions Part II

Materials

1. 4 plastic gallon containers with prepared solutions. These should be prepared about 8 hours in advance or overnight.

Container	Color	Coarse Salt
G	Green	Greatest 4 cups
R	Red	Medium 2 2/3 cups
C	Clear	Least 1 1/3 cups
B	Blue	None

2. plastic trays (3 1/4"x7"x1 3/4") with cover
3. 4 or more plastic tubes 1"x2 1/2"
4. 1 plastic eyedropper
5. 1 plastic mold for holding solutions
6. Food coloring red, blue, green
7. Coarse Salt

8. Cardboard trays
9. labels for trays
10. plastic pails - for water cleanup, etc.
11. paper towels
12. crayons   blue- green- red

The solutions should not be colored before the class the first time they are introduced. If the liquids are colored before the children see them, children often think that the color is an unchangeable property of the liquid instead of a means of identification. Do not tell which color has what amount of salt.

Vocabulary

1. solution
2. density

Objective

1. be able to arrange liquids in their order of density
2. show amount of density to sinking or floating in other densities
3. record either by writing or in pictures their observations on the behavior of food coloring in liquids of different densities.

Procedure

Show the class the four gallon containers filled with prepared salt solutions and tell them that the liquids in these containers are all different despite their similar appearance. Ask the students how they can keep track of the different liquids if they put them in theiur tubes. They will probably suggest coloring them. The food colorings vary in strength. In order to maintain a consistent depth of color, you will want to use about 20 drops of red, 8 drops of green and 8 drops of blue.

Explain to the students now that one container has no salt and each of the others has different amounts of salt. It is their job to figure out which color has each amount of salt.

Now give them the supplemental sheet which begins with two colors at a time, graduating to three then four. The colors they are to try are already on each picture. They should use crayons to color in which color sinks or floats.

Supplemental

Worksheet for coloring what layers should be.

Evaluation

Ask students if they were given a known or unknown liquid how they would figure out where it would belong on a upness or downess chart.

no salt	B	top
1 1/3cup	C	
2 2/3cup	R	
4	G	bottom

EXPERIMENT 3 Colored Solutions - Part III

MATERIALS

1. 4 gallons of the already prepared salt and saltless colored solutions
2. 6 plastic tubes (1" x 2 1/2")
3. 1 plastic eye dropper
4. I plastic tray
5. large tray
6. white vinegar
7. apple juice
8. small piece of wood
9. small piece of stone or other heavy object
10. ocean water (lake water can be substituted)
11. cranberry juice
12. milk

OBJECTIVES

By this time the children have established an "upness-downess" order for the four liquids they have been using. They should now be able to place other liquids or objects in the chart.

PROCEDURE

The children should set up the four solutions in the positions they belong or they can test each new item with the four individual splutions. You might begin by showing the children one of the new liquids and asking them how they can figure out where it belongs in the "upness-downess" chart. If they are testing individually and the new liquid floats on blue, they are finished testing the liquid.
WARN children not to taste any of the liquids they are not sure of.

Remember, all layers need not be set up to test a new liquid. Just two items need be tested at a time.

EXPERIMENT 4 Thermometer

GENERALIZATIONS

1. Liquids expand when heated and contract when cooled.
2. The child will construct, calibrate and read a water thermometer.
3. The child will be introduced to the notion that a given weight of water will take up more volume as it is heated. This will be valuable in the next lesson where the student investigates convection currents. This will introduce the student to the fact that the density of water decreases as water is heated. Therefore, hot water floats over cold water.

PREPARATION AND BACKGROUND

A one-hole rubber stopper and glass tube are more reliable than clay and a straw. Wet the tube and stopper before inserting the tube. Hold the tube with a folded paper towel to guard against breakage and use a twisting motion.

Water, especially with this large volume, takes considerable time to gain and lose heat, so readings should be hours apart.

Childrens' thermometers will be influenced a bit by evaporation in the straw. To prevent evaporation, put a few drops of light machine oil into the straw after assembling the thermometer.

MATERIALS

1. small soda bottle
2. small card
3. sticky tape
4. red food coloring
5. thermometer
6. clay
7. plastic straw
8. crayon
9. pencil
10. ruler

RESOURCE - Science in Elementary Education; Ed. Peter Grega, 1986

VOCABULARY
temperature, expand, contract

PROCEDURE

Show a thermometer. Many thermometers use red colored alcohol or mercury in a closed tube. What happens to these liquids when they get warmer? Cooler? You can make a thermometer that works in the same way.

The students will make a water thermometer. Because of time limitations, the students will be given a completed thermometer to work with during the session but they will construct their own thermometer to take to their classrooms and use to record the temperature over the course of the week.

The students will start at step 6 with the thermometer provided to them. They will start at step 1 with the thermometer they will construct by themselves.

1. Fill the bottle almost full with water.
2. Add some food coloring to the water so it is easy to see.
3. Dry the bottle opening with a paper towel. Then put the straw about half-way into the bottle opening.
4. Use clay to stop up the bottle opening and around the straw. Try to get a tight fit, without getting the clay wet.
5. The water should rise about half-way up the stray beyond the clay. If not, move the straw up or down. Then press the clay down tightly again.
6. Place the bottle in hot water for 20 minutes and mark the water level on the straw with a crayon. Put the bottle in cold water or ice for 20 minutes and mark the level.
7. Measure the distance between the two marks. On a card, mark two dots the same distane and draw evenly spaced lines between. Give each line a number, with the highest on top. Put the column of numbers on the right side of the card.
8, Tape the card to the straw so the top and bottom numbers are even with the two marks.

Provide each child with a chart of Water Thermometer Readings and Discovery Problem Questions. Make sure you go over the procedure on how to use the chart to record the temperature.

Questions

1. At what time during the day when you measured the temperature is it coolest? warmest?
2. Which day during the week had the coolest morning? Noon? Afternoon?
3. How closely can you predict the noon temperature from the 9:30 AM temperature? The 3 PM temperature from the noon temperature?
4. Construct a graph displaying the temperature at different times during the day.

ACTIVITY 2

1. Snap a balloon opening over the bottle opening
2. Heat the bottle by putting in hot water
3. Observe what happens to the balloon.
4. What happens when the bottle is cooled?

Generalizations

1. Liquids and gases expand when heated and contract when cooled.
2. The density of water changes with temperature. This will be a hard concept to get across. Hopefully, we can try to convey that a given volume of hot water will weigh less than a given volume of cold water. Maybe this can be demonstrated by filling a beaker with water, heating the beaker and letting the water expand and overflow. The students will then see that the heated container of water has lost some water and therefore should have less weight. The students will have to understand that we are not adding any water as we heat it. The mass or weight of water is not changing by raising the temperature; the volume of the water is changing. This may be one of the most difficult concepts we will try to get across and children of this age may not be able to get it. It would be nice if they do reach this conclusion, for it will lead in nicely to the experiment on convection currents. If they fail to get it then they will do a series of experiments the next day which will demonstrate that hot water is less dense than cold water.

EXPERIMENT 5 CONVECTION CURRENTS

OBJECTIVE

The objective of this set of experiments will be to use some of the concepts that we developed earlier to explore convection currents. By unevenly heating a liquid we can cause currents to flow in the liquid. We will try to build upon the concepts developed in the thermometer and colored solutions activities. We will try to develop an understanding of what causes convection currents and see if we can use what we learn about convection currents to see what causes the wind to blow.

Protocol

The first series of experiments concerns observing whether hot water floats or sinks in cold water. Provide students with a clear container of room temperature water. Also provide students with two colored water solutions that are maintained at different temperatures. Keep some blue water in an ice bath and red water in a hot water bath. It would be convenient to keep the colored solutions in test tubes sitting in an appropriatee water bath so the students can take the test tubes to their work stations to do the experiment. Have the students carefully add the hot water to the container of clear water and record what happens to the water. It should go to the top. Have the students carefully add the cold water; it should sink.

We imagine that trying to explain the results of these experiments in terms of earlier experiments will be very difficult. Conceivably they can relate the thermometer activities where they observed a certain amount of water contacts as it is cooled. Therefore, a container of cold water has more mass than an equivalent volume of hot water. The cold water is more dense.

This might be demonstrated in the following way. Fill two flasks with water and put them in a boiling water bath. Present the students with the two flasks stressing they have the same amount of water. Now remove one of the flasks and place it in a cold water bath. As the water cools it should contract and no longer appears full. To fill the cold water flask it will be necessary to add more water. Therefore, the flask of cold water has a greater mass or weight of water. Hopefully they could make the connection that since the same volume of cold water has more weight than the hot water, the cold water sinks under the hot water.

Materials

1. clear plastic container of water
2. eye dropper
3. test tubes
4. hot water bath
5. cold water bath/ ice
6. racks to hold tubes

The second series of experiments involves studying how convection currents form as a beaker of water is heated by a candle. By unevenly heating water, we can create regions of hotter water and regions of cooler water. Since the cooler water sinks below the hotter water, the water begins to move in currents

PROCEDURE

1. Position a large beaker of water slightly over the edge of a table.
2. Gently place a drop of food coloring on the bottom of the beaker, exactly where it hangs over the table. Students should touch the eye dropper to the bottom of the beaker before depositing the dye. To avoid disrupting the water, maintain a constant pressure on the eye dropper bulb until the dye is squeezed out.
3. Heat the food coloring spot with a candle flame. What happens?
The ink spot rises in the water, circles around the top of the beaker and sinks on the opposite side.
4. Heat travels through the water by convection. As the ink spot is heated, it expands (it becomes less dense) and rises. Cool water replaces the displaced ink, setting up a circular convection current.

MATERIALS

1. A large beaker of water.
2. Food coloring
3. An eye dropper
4. A candle and matches

WATER WIND

The following demonstarion could be used to see how convection currents can be used to explain winds. It will be necessary to build a tank consisting of two large glass plates separated by thin spacers (approximately 1/2" thick). The tank is filled with water. I used two glass panes separated by thin strips of plastic. They were glued into place with a waterproof sealer.

By carefully adding cold blue water and hot red water we can quickly repeat the observations that hot water floats and cold water sinks.

One can demonstrat convection currents by unevenly heating the water. This can be accomplished by taking a hot water bag and pressing it against the back glass plate. This creates a hot region of water in the tank. Similarly a water bag filled with cold water permits cooling of regions of water in the tank.

The water bags consist of plastic cooking pouches filled with water that are then sealed. The water pouches are incubated in either hot or cold water before the demonstration.

By placing drops of food coloring into the tank it is possible to follow the movement of the water in the tank. The effects are rather dramatic. Generally, water rises in the heated regions and sinks in the cooler regions. Along the bottom of the tank (corresponding to the surface of the earth at the bottom of the atmosphere) the water moves from the cooler regions to the hotter regions. At the top of the tank the water moves in the opposite direction.

It should be possible to ask the students to predict how the water will move before you heat or cool it. Their predictions will serve as a diagnostic to let the instructor know how well the students are understanding the concepts developed in the program.

CONVECTION MACHINE

OBJECTIVE -

To build a simple windmill that will rotate in the convection currents of a burning candle.

PROT [illegible]

1. Cut a snake from an index card.
2. Tape a thread to the center of the snake and suspend it above a burning candle.
3. Tell how your convection machine works.

An upward convection current is created as warm air rises above the candle and cool air is drawn into the flame from the sides. The "snake" spins in this stream of warm air in the manner of a windmill.

MATERIALS
1. scissors
2. a 4x6 index card - foil, pie pan
3. candle and matches
4. thread
5. tape

EXPERIMENT 6 HOT AIR BALLOONS - SESSION I

OBJECTIVE
1. After hearing the story, students will be able to tell simply how the elevation of a hot air balloon is regulated.
2. With help, students will construct a tissue paper hot air balloon as a group project.
3. Students will suggest a variety of ways to contron the elevation of their hot air balloons.

MATERIALS
1. book -Hot Air Henry by Mary Calhoun (available at Main, Francis, Tutt, LaSalle and River Park branches of the Public Library)
2. 7 sheets of 20x30 (approx) tissue paper/balloon
3. light weight wire
4. scissors
5. glue
6. duct tape or strapping tape
7. 2-5 soup, coffee, pretzel or juice cans (all same diameter)

VOCABULARY - nothing new

PROCEDURE

1. Story and discussion - 15 minutes
Read aloud Hot Air Henry by Mary Calhoun. Be sure to show the pictures; they are excellent!
Discuss: 1. How did they blow the balloon up at first?
2. Why was a winter day a good day to fly the balloon?
* 3. How did the cat make the balloon go higher?
* 4. How did he make it come down?
* 5. How did he steer it?
6. Why did he have to avoid the power lines?

* questions are critical to this lesson

2. Construction of tissue balloon (20 min)
This project most be closely directed by an adult. Groups should have no more than 3 or 4 members. Complete steps 1-6 (at least 1-4) during session I of the balloons project. Remaining steps through 10 should be completed by an adult after the children are gone. [Steps 7 and 9 are too difficult for a child and will probably try the patience of an most adults. Step 5 can also be difficult.]

3. Discussion (5 min)
List all responses to these questions on the board. There is no "right" answer - variety and depth of thought are the goals.

1. How might we make our balloons go up in our next session?
2. How might we make them come down?

EXPERIMENT 6 HOT AIR BALLOONS- SESSION II

OBJECTIVES

1.students will fill their balloons with hot air and fly them.

2.students will explain how and why a hot air balloon rises.

MATERIALS

1.balloons constructed previously
2. propane camp stove and fuel (one for each group is ideal)
3. matches
4. scotch tape for repairs
5. pot holder and mittens
6. flue (step 10)

VOCABULARY

1.flue

PROCEDURE

1. Balloon check (15 min)
Have the students check the balloon for unglued seams, holes, etc.; fix with scotch tape. Discuss reasons for needing a no leak balloon.
2. Balloon launch (15 min) at 65 degrees F or cooler. With great care, follow step 11 of the directions. If possible, use one of session I's suggestions for controlling the height of the balloons elevation.
3.Discussion - wrap up
 a)How did we get the hot air balloon to rise?
 b) Were there problems? What happeneed? Why?
 c) Why might some rise more quickly than others?
 d) Why does a hot air balloon rise?
   1. Can you explain this in terms of density?
   2. How can one type of air be more dense than another?

Note. Balloon will not lift in temperature higher than 60-65 degrees. At 60-65 deg, lighten the balloon before launch by taping the hole to the desired size and removing the wire. Use light weight tape.

Alternate balloon will lift slightly at 70 deg. Seal all holes in a dry cleaner bag. Tape bottom opening to make a blue hole slightly larger than the flue. Be particularly cautious - if it touches anything hot or is close to the opening of the flue, the plastic melts.

Taken from

WIND WALK

Once you and your group are out in the breeze, ask them how they can tell it's a windy day. The obvious answer is that they can feel the wind blowing. But as you walk along, have them look for other windy day "clues." Point out blowing leaves, swirling dust, swaying branches, waving flags, and other windblown things. You may also want to have the kids lie on their backs and look up at the sky to find another clue—moving clouds. They might see that the wind near the ground sometimes blows in a different direction from the wind high up in the atmosphere. *Warning: When the children lie down, make sure they face in a direction that will keep them from looking directly into the sun.*

A nice way to end a wind walk is to have the kids blow bubbles and watch which way the wind takes them. Just bring some "magic bubble mix" (see recipe below) along with you as you walk. Also bring along some bubble dippers and a pan to pour the mixture into. To make a bubble dipper, twist one pipe cleaner into a loop and attach it to another pipe cleaner. Curl any sharp ends out of the way.

As a follow-up to the activity, pass out copies of page 24 for the kids to work on. When they are finished, have the kids tell how the animals and plants they drew are affected by the wind.

MAGIC BUBBLE MIX

- 3 cups warm water
- 8 tablespoons glycerine (available at most drugstores)
- 8 tablespoons liquid dish detergent
- 1 dash sugar

Put everything together in a leakproof container and shake thoroughly. Your magic bubble mix is ready!

Crazy Hot Air Balloons

Make a hot air balloon.

Objective:
Observe that hot air rises.

Ages:
Primary and Intermediate

Materials:
- ***7 sheets of 20 × 30" (50 × 75 cm) tissue paper***
- ***lightweight wire (14 inches [35 cm] long)***
- ***camp stove (A compact, propane camp stove with 6–8 inch [15–20 cm] legs works best.)***
- ***camp stove fuel***
- ***matches***
- ***scissors***
- ***glue***
- ***clear tape***
- ***duct tape***

(continued next page)

Using tissue paper and glue, your kids can make their own hot air balloons. It's a great way to show that hot air rises. (See page 20 for Figures 1–8.)

1. Place one sheet of 0 × 30-inch (50 × 75-cm) tissue paper on top of another. Fold the pieces in half lengthwise and cut along the fold. This will make four pieces of tissue paper, each measuring 15 × 20 inches (38 × 50 cm). (See Figure 1.)
2. Stack the four halves evenly. Position the stack so the 20-inch (50-cm) sides are at the top and bottom. Fold the pieces in half, then fold them in half a second time in the same direction.
3. Open the last fold you made and make a diagonal fold along the line shown in Figure 2. Be sure to make the fold along the margin that is *not* closed. Cut along the diagonal fold line. When you unfold the sheets, they should look like the drawing in Figure 3.

Bruce Norfleet

- *or coffee cans (all with the same diameter)*
- *thick gloves or pot-holder mittens*

Subjects:
Science and Crafts

Take one of the sheets you just made and glue it to a sheet of 20 × 30-inch (50 × 75-cm) tissue paper, as shown in Figure 4. (Use the glue sparingly and make the 1-inch [2.5-cm] seam along the 20-inch [50-cm] side of the sheet.) Do the same for each sheet, making four balloon sides.

5. Making 1-inch (2.5-cm) seams again, glue the edges of the sides together so that your balloon looks like the drawing in Figure 5.
6. To make a top for the balloon, take the last sheet of 20 × 30-inch tissue paper and cut a 10 × 20-inch (25 × 50-cm) strip from one end. (See Figure 6.) (Fold A to B and cut off C)
7. Glue all four sides of the 20 × 20-inch (50 × 50-cm) squ top to the sides of the balloon's l opening.
8. Bend 14 inches (35 cm) of lightweight wire into a circle and twist the ends together. (See Figure 7.)
9. Place the wire circle just inside the balloon's smaller opening. Fold the surrounding tissue paper over the wire circle and tape in place with clear tape.
10. To make a heat flue for filling the balloon with hot air, cut out the ends of five cans. (Be careful of the sharp edges!) Be sure all the diameters of the cans are the same size. (A diameter of 3 inches [7.5 cm] works well.) Remove any paper labels from the cans by soaking them in hot water. Dry the outsides of the cans, stack one on top of another, and tape them together with plenty of duct tape. (Cardboard frozen juice cans can be used instead of metal cans to make a flue.)
11. *Caution:* Before launching the balloon, read *Hot Tips*. Then hold the flue over the heat source and lower the wire-ringed end of the balloon over the top end of the flue. Let the balloon fill with hot air until it will rise on its own. (See Figure 8.)

Figure 1

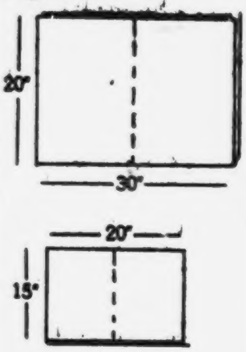


Figure 2

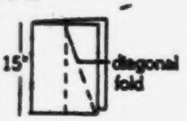


Figure 3

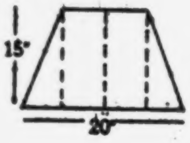


Figure 4

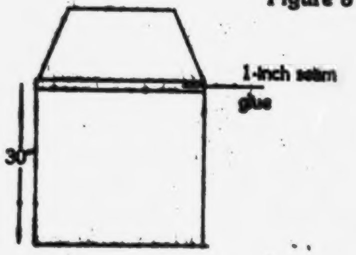


Figure 5

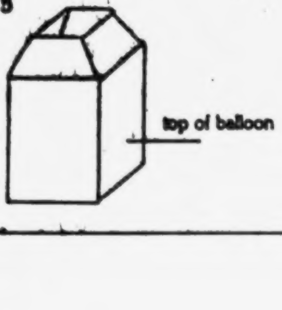


Figure 6

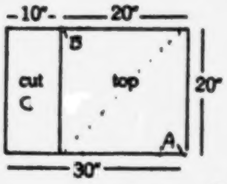


Figure 7

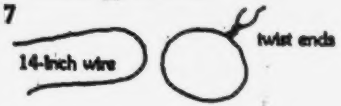
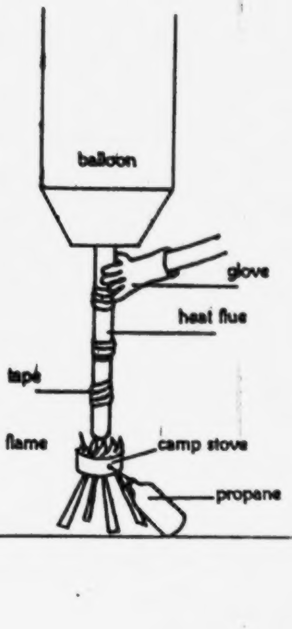


Figure 8



HOT TIPS

- Each balloon may be decorated or personalized with streamers or markers. But remind your group that any extra weight may slow the balloons down.
- Find a launch site in an open area away from trees, electrical cables, and power lines. Picnic tables make good launching platforms.
- Since the balloon is highly flammable, an adult should take charge of the heat source. Older students may handle the flue with thick gloves or pot holders, and younger ones can help hold the balloon in place before lift-off.
- Be sure to avoid placing the flue directly in the flame.
- Cool, calm days are the best for flying. Wind will quickly cool the balloons and may blow them away. And the balloons will have a hard time getting started on hot, humid days.

Idea by Dr. Milton Payne, Box 1307, Stephen F. Austin State University, Nacogdoches, TX 75962. Instructions reprinted with permission.

The syllabus described above is intended as an eight session science unit for lower primary school students. The syllabus includes a series of activities relating to density and buoyancy. In particular the unit begins with an exercise in which students develop a rule to determine if an object will sink or float in water. The second activity involves the construction of clay boats. Hopefully, the students can use the models or rules developed during the first activity to understand how reshaping a lump of clay permits it to float in water. The third and fourth activities extend the exploration of buoyancy from solid objects floating or sinking in water to the behavior of liquids with different density.

The fifth activity involves exploring the effect of temperature on the volume and density of water. The students use the fact that liquids expand when heated to build thermometers. In the following activity the students use the fact that the density of water changes as it is heated to explore convection currents. They will use this information to understand what causes the wind to blow. The final activities will use the concept that the density of air changes as it is heated to build a hot air balloon.

The syllabus was designed with the intention of developing mental models to explain the material covered in the program. Part of the excitement of scientific inquiry involves developing models or theories to explain the world about us. By testing, extending and modifying these models we deepen and broaden our understandings. This is a demanding but extremely rewarding process. It involves developing insights and strategies to solve problems. Often this aspect of scientific inquiry is missing from science curricula.

One of the intentions of the designers of this unit was to develop models which can be tested, expanded and used to explain a number of observations. For instance, the initial exercise involves developing a rule or model to determine if an object will sink or float. We will then use that concept to explain why a boat floats. This concept will be extended and expanded to develop an understanding of what causes the wind to blow, to construct a thermometer and to build a hot air balloon. Hopefully, the student will find the experience rewarding.

The draft of the program was developed with the collaboration of Karen Watson, Ruth Craft, Phyllis Teager, Cathy Metcalfe, Rosemarie Greenlee during the summer of 1986. Mrs. Teager, Metcalfe and Greenlee are teachers at Muessel School in South Bend and have arranged to hold an eight session after school program for selected second graders at Muessel during the early part of 1987. We will use the syllabus as a core for this program. After making the appropriate modifications following the trial run, we will make the program available to other teachers.

Elliot Rosen ..

THE SECTION OF THIS DOCUMENT ON "SCIENCE FROM OTHER PERSPECTIVES" HAS NOT AND WILL NOT BE COMPLETED - per phone conversation with Vivian Lutz at the Community Education Roundtable project.

Project
M.A.S.T.E.R

Halley's Comet in the Mind's Eye

On April 6, 1986, the M.A.S.T.E.R. Project sponsored a Halley's Comet Day, bringing together a group of co-sponsors from area schools and libraries in order to celebrate the coming of the comet and highlight the science teaching and learning resources in the county. Participating groups including all area Library "Friends"--IUSB, Notre Dame, South Bend, and Mishawaka. The planetarium directors of all three public school systems presented materials on their own facilities and discussions featuring their own special educational interests. The M.A.S.T.E.R. project sponsored the keynote speaker, educational director of the Adler Planetarium in Chicago. Two Notre Dame professors spoke about their work on Mark Twain (who was born and died in years when the comet made earlier appearances) and on extra-terrestrial space. Hundreds of citizens in St. Joseph County, including teachers, attended that event, held in a community cultural center.

Project
M.A.S.T.E.R

Audio Science

The science radio programs developed by John V. Davis, the Science Coordinator for the South Bend Community School Corporation, offer elementary school teachers a lively and useful way to bring basic science concepts into their classrooms. As brief vignettes, they focus on key ideas and may be used in conjunction with bulletin board materials and class experiments designed by the teacher--and the students. While in South Bend they are broadcast over school radio, and thus available for the homebound student (and parents), they can be brought into any classroom by audiotape. A sample tape is available, along with descriptive materials. The teacher can also use these tapes to develop problem solving and listening skills.

APPENDIX: Topics of WETL-FM School Radio Science Network Tapes
Developed in coordination with Grade 1-3 Science Objectives

John Davis, Science Coordinator

OBJECTIVE

Grade 1

01 Identify how people find out about their surroundings through their senses.
02 Observe and describe living and nonliving things.
03 Classify objects as living or nonliving things.
04 Describe appropriate activities and clothing for different types of weather.
05 Observe and describe air in relationship to their environment.
06 Identify human activities that cause air pollution.
07 State several ways in which water is important for living things.
08 Describe and state the various ways people pollute water.
09 State that light and water are necessary for normal plant growth.
10 Observe and describe physical properties of rocks and soil.

Grade 2

11 Identify the weather characteristics of each season.
12 State that sound travels through air; that there must be vibrations to produce sound and that the ear senses sound.
13 Identify different kinds of food, explain the need for many different kinds of food and discuss care of teeth.
14 Recognize the source of light and explain the position of the source when a shadow is long or short.
15 Describe kinds of motions and use basic directions to describe objects moving from place to place.
16 Demonstrate the position of the earth, sun and moon during day and night; using a light, a globe and a ball.
17 Use a thermometer, identify uses of heat energy; state that heat is a form of energy that may move from place to place.
18 Classify objects as those which are attracted by a magnet and those which are not attracted by a magnet.
19 Classify plants and animals as belonging in a forest community or not belonging in a forest community.
20 Classify plants and animals as those belonging in a pond community and those not belonging in a pond community.

Grade 3

21 Identify and describe the habitats of plants and animals.
22 Identify characteristics of a population, explain how it grows, works and what happens when food is limited.
23 Identify the activities of organisms in a community and explain the food chain.
24 Describe the different paths water takes during the water cycle and identify the different forms of water.
25 Describe different land forms and tell what happens to the forms when they are weathered, eroded, and moved.
26 Define a star, identify simple constellations and explain how the sun is important to life on earth.
27 Name and describe a variety of machines and their functions.
28 Identify an electrical circuit, list ways to conserve electrical energy and list safety precautions for using electricity.
29 Identify foods of the 4 basic food groups and foods rich in starch, sugar, fat and proteins and explain functions of these.
30 Describe what happens to food in the body and name the various parts of the digestive system.

1ST GRADE SCIENCE

SOUTH BEND COMMUNITY
SCHOOL CORPORATION

1st GRADE SCIENCE

FOREWORD

"1st Grade Science" is a radio supplement of twenty-four lessons based on the adopted textbook, Heath Science, Level 1. The program format uses dialogue between the teacher, Mr. Dee, and a student, Peppy. Peppy actually is a puppet which I hope the children will identify with.* We have been very careful not to identify Peppy as male or female. In an attempt to develop programs with a fast moving pace, no script was developed and we may find Peppy from time to time being even a little mischevious.

Our primary goal was to make a series of radio lessons that are educational, somewhat entertaining and definitely supplementary to your textbooks. You will find that the guide for each lesson includes a list of KEY WORDS. These are words that may be new to the student, may be somewhat difficult for a first grader, or may be strictly scientific terms. You may want to discuss these KEY WORDS before the broadcast and even place them on the chalkboard. These words have been listed only so that special attention will be devoted to them to assure the student the fullest possible understanding of the radio lesson. You will also note that the Main Points might be brought to the attention of your students previous to listening to the lesson as a means of alerting them to listen for particular information. At other times, you may wish to use these points as a guide for discussion following the broadcast.

This series of radio lessons was produced entirely by WETL Radio. Credits are due to Laura Moran, who was the voice of Peppy, and Jerry Limbert for the excellent work he did in recording and editing the broadcast tapes and for preparing this Teacher's Manual.

I hope that you and your 1st grade students will enjoy using these supplementary radio lessons as much as we enjoyed producing them.

Sincerely,

John V. Davis

John V. Davis (Mr. Dee)
Coordinator of Science & Health Education

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*You may secure a picture of Peppy for your classroom by requesting it from Mr. Dee.

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1ST GRADE SCIENCE

LESSON 1

"Ways to Find Out"
"Eyes"
"Seeing Big Things and Small Things"

(Textbook supplement - pages 1 -- 9)

MAIN IDEAS

- People use their senses of sight, hearing, smell, touch, and taste to find out about the world.
- We see with our eyes.
- People see big objects and small objects.

OBJECTIVES:

- To identify how people find out about their surroundings through their senses.
- To identify the eye as the part of the body with which we see.
- To classify objects as big and small.

KEY WORDS:

SCIENCE
LIGHT
HEAR
PLANTS
WATER
ROCKS
SENSES
EYES
LITTLE
BIG

MAIN POINTS:

1. Some things in SCIENCE may be almost like "magic." Have you ever thought about how LIGHT comes about when you flip that LIGHT switch? How do we HEAR? How are ROCKS made?
2. People use their SENSES to identify objects.
3. Cover up your EYES and try to walk around the room or do anything with your EYES closed or covered.
4. Our EYES let us learn what's all around us.
5. People's EYES are not all alike in color. Animal's eyes are shaped differently. EYES of insects are different and can see all around.
6. Insect EYES are made of many sections.
7. Frogs and fish have big EYES.
8. When reading, people should have the proper LIGHT and wear glasses (if needed).
9. It's very important that people have their EYES checked every year by a person who is a doctor.
10. One important use of the EYES is to see the size of things.
11. Things are either BIG or LITTLE. (If something is smaller than your hand, you could say the object is LITTLE.)
12. If something is bigger than you are, you could say the object is BIG.

LESSON 1 (continued)

REVIEW:

1. Our SENSES are seeing, hearing, smelling, tasting, and touching.
2. Sight tells us if things are BIG or LITTLE: sight helps us tell color, and shape.
3. People have five (5) SENSES.

LESSON 2

"Seeing Many Sizes"
"Seeing Many Shapes"

(Textbook supplement - 10 -- 16)

MAIN IDEAS:

- People see many different sizes.
- Size is a property of objects.

OBJECTIVES:

-- To classify objects by size.
-- To identify four geometric shapes: circle, triangle, square, rectangle.
-- To describe similarities and differences in the shapes of spheres, cylinders and disks.
-- To identify objects as round, rectangle, square, triangular in shape.

KEY WORDS:

SIZE
PROPERTY
SHAPE
TRIANGLE
SQUARE
CUBE
ROUND
SENSES
EYES
HOLLOW
TUBE
CIRCLE
DISK
CYLINDER
LONG
RECTANGLE
ANGLE

REVIEW:

1. Our SENSES are seeing, hearing, smelling, tasting, and touching.
2. Our EYES let us compare sizes, shapes and see colors.
3. People have different colors of EYES.
4. Animals haves different kinds of EYES.

MAIN POINTS:

1. Whenever we talk about LARGE or SMALL we are talking about the SIZE of things.
2. SIZE is a PROPERTY of a thing.
3. All objects have PROPERTIES.
4. It's important for clothes to have different SIZES. (Things should change in SIZE as we also change in SIZE)
5. The SIZE of a football field is always the same SIZE.
6. We can tell money by the SIZE of the coins.
7. Our homes have different SIZES. (Compare McDonalds to Century Center or a Downtown Parking Garage)
8. SHAPE is a PROPERTY of a thing.
9. All objects have SHAPE.

10. A TRIANGLE has three sides.
11. A box is a SQUARE; a CUBE is a solid SQUARE box.
12. A baseball is ROUND in all directions.
13. A pole is long and ROUND; if it were HOLLOW, it would be a TUBE.
14. A CIRCLE that is thick is a DISK.
15. A CYLINDER is ROUND, HOLLOW, LONG, and open at one end.
16. A SQUARE has four sides and they are all equal sides.
17. A TRIANGLE has three sides and has a point on every corner (ANGLE).
18. A RECTANGLE has two long sides and two short sides.

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LESSON 3

"Seeing Many Colors"
"Making Colors"
"Light"

(Textbook supplement - 17 -- 23)

MAIN IDEAS:

- People see many different colors
- Color is a property of objects
- Some colored paints can be mixed to make other colors.
- Light enables us to see.

OBJECTIVES:

-- To classify objects by color.
-- To discuss colors in the environment.
-- To generalize and state that people need light to see.
-- To classify objects by color.

KEY WORDS:

PROPERTY	CLASSIFIED	BIG	SMALL	MEDIUM
RELATION	SIZE	SHAPE	SQUARE	TRIANGLE
CIRCLE	RECTANGLE	ROUND	SOLID	ANGLE
CYLINDER	TUBE	EYES	COLOR	WHITE
REFLECT	SUN	HOT	COLD	RED
BLUE	YELLOW	MESSAGES	GREEN	PRIMARY
BASIC COLORS	LIGHT			

REVIEW:

1. All objects have PROPERTIES.
2. A SHAPE is a PROPERTY of an object.
3. Objects can be CLASSIFIED as BIG, SMALL, and MEDIUM (In RELATION with one another).
4. It's important to have different SIZES of an item (clothes, coins, etc.)
5. Some things stay the same SIZE.
6. 4 basic SHAPES are: SQUARE, TRIANGLE, CIRCLE, and RECTANGLE.
7. A CIRCLE doesn't have any sides (CIRCLES are ROUND like a baseball.)
8. A SQUARE would be like a box, it has 4 sides and sides are all even lengths.
9. If a SQUARE is SOLID, it would become a CUBE.
10. A RECTANGLE has 4 sides that are 2 long ones.....and 2 short ones.
11. A TRIANGLE has 3 sides, all the same length, with a point on each ANGLE.

12. A CYLINDER is a TUBE with one end closed.

MAIN POINTS:

1. Another PROPERTY of an object other than SIZE and SHAPE is COLOR.
2. People have to use their EYES to find COLOR in things.
3. WHITE and light colored clothing helps to REFLECT the SUN. (Some COLORS help to keep warm or cold.)
4. Some COLORS are HOT and COLD. (RED is HOT; BLUE is a COLD COLOR).
5. Some COLORS make you feel happy or sad (YELLOW is a cheerful COLOR.)
6. The COLORS we use in our home has a lot to do with how we feel.
7. COLORS can give us MESSAGES (RED means to "stop" or "danger"; GREEN means to "go"; YELLOW means "to be careful"; and BLUE lights on a vehicle mean a volunteer fireman; BLUE on a truck means it is probably a tow truck.)
8. COLORS can change if they are mixed together.
9. PRIMARY or BASIC COLORS are: RED, BLUE and YELLOW.
10. All things have 3 PROPERTIES: SIZE, SHAPE and COLOR.
11. You can't see anything without LIGHT reflecting the COLOR and SHAPE.

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LESSON 4

"Hearing"
"Smelling"

(Textbook supplement - 24 -- 31)

MAIN IDEAS:

- Hearing with our ears is a way to find out.
- People hear many different sounds.
- Some objects produce sound.
- Smelling with the nose is a way to find out.
- People can smell many different kinds of odors.

OBJECTIVES:

-- To identify the ear as the body part that senses (hears) sounds.
-- To identify the nose as the part of the body that smells odors.
-- To observe and describe the sources of different kinds of odors.

KEY WORDS:

PROPERTY
COLOR
SHAPE
SIZE
REFLECT
DARK
HOT
RED
BLUE
GREEN
YELLOW
COOL
EARS
LIGHT
PRIMARY COLORS
HEARING
SOUNDS
AIR
VIBRATES
OUTER EAR
INNER EAR
DAMAGE
EAR DRUM
SENSE
SMELL
NOSE
ODOR
ASSOCIATE

REVIEW:

1. COLOR is one of the PROPERTIES of anything that we can see.
2. Anything that we can see has three PROPERTIES: COLOR, SHAPE and SIZE.
3. Light COLORS of clothes REFLECT the heat from the sun; DARK clothes make you get HOT.
4. Some COLORS make us feel different ways; RED is a HOT COLOR; BLUE or GREEN are COOL COLORS; YELLOW is a cheery COLOR.
5. COLOR sometimes gives us a "message" (traffic signal); RED means "stop"; GREEN is for "go"; and YELLOW means "yield").
6. PRIMARY colors are: RED, BLUE AND YELLOW.
7. Without LIGHT you wouldn't be able to tell the PROPERTIES of an object.

MAIN POINTS:

1. We use our EARS for HEARING.
2. Animals don't have the same kind of EARS.
3. EARS are shaped to pick up the SOUNDS in the AIR.
4. SOUNDS are caught in the OUTER EAR but no HEARING takes place there.
5. Little bones in the INNER EAR pick up the VIBRATIONS that come from the air.
6. The EAR DRUM is between the OUTER EAR and the INNER EAR. (It's called a "drum" because it's tight and it VIBRATES.)
7. Never put anything into your EARS.
8. EARS should be cleaned with a wash cloth or a cotton swab -- but never put anything more into the EAR than that.
9. Never listen to a loud sound like a stereo or something like that because that can DAMAGE your EAR DRUM.
10. Another SENSE is SMELL.
11. We use our NOSE to SMELL.
12. A "room freshener"doesn't get rid of the SMELLS, it just "covers up" the ODOR.
13. We often ASSOCIATE one SENSE with another.

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LESSON 5

"Tasting"
"Feeling"

(Textbook supplement - 32 -- 39)

MAIN IDEAS:

- Tasting with the tongue is a way to find out.
- Some foods can be identified by their taste.
- Touching with our skin is a way to find out.
- People can feel many different kinds of textures.
- Objects have different kinds of textures.

OBJECTIVES:

-- To identify the tongue as the part of the body that senses taste.
-- To identify a few common foods by their taste.
-- To identify the skin as the part of the body that senses touch.
-- To observe and describe the textures of some objects.

KEY WORDS:

HEAR
INNER EAR
SMELL
SENSES
SALTY
FEELING
ROUGH
WET
EARS
EAR DRUM
NOSE
TASTE
BITTER
SHAPE
HARD
DRY
OUTER EAR
IDENTIFY
MOUTH
PROPERTY
SOUR
SIZE
STICKY
MAGNIFY
NOISES
WATER
FOOD
COLD
SOFT
HOT
SOUND
HEARING
SALIVA
SWEET
POISON
SMOOTH
WARM

REVIEW:

1. We HEAR with our EARS.
2. The OUTER EAR is the part of the EAR we see on our head.
3. The OUTER EAR "collects" and MAGNIFYS the SOUNDS.
4. The INNER EAR is inside the head and contains the little bones and the EAR DRUM that makes the SOUND.
5. Many times we can identify objects just by the SOUNDS they make.
6. Some of the SOUNDS are pleasant or unpleasant.
7. Soft SOUNDS are pleasant; loud SOUNDS are unpleasant.
8. Animal EARS are shaped in different ways to collect the SOUNDS.
9. Never put anything into your EARS except a cotton swab or a wash cloth.
10. Loud NOISES could cause you to loose some of your HEARING (loud radio or tape players for example).
11. We do our SMELLING with our NOSE.
12. We "learn" SMELLS and can IDENTIFY them.
13. Some SMELLS can start our MOUTH to WATER (SALIVA)
14. We use our SENSES to find out about things around us.

MAIN POINTS:

1. TASTING and SMELLING helps us to decide whether we like a certain food or not.
2. SMELL and TASTE work together.
3. Sometimes things will SMELL good to us, but TASTE bad (vanilla, green apples, etc).
4. When you have a COLD your food doesn't TASTE good because you can't SMELL it.
5. PROPERTIES of FOODS are: SWEET, SALTY, BITTER, and SOUR.
6. One very important "rule" about TASTING: Never put anything into your mouth that you don't know what it is. (Some POISONS may SMELL good.)
7. FEELING lets you tell the SHAPE and SIZE of an object.
8. FEELING lets you tell the PROPERTIES of SOFT, SMOOTH, ROUGH, HARD, STICKY, HOT, COLD, WARM, WET, and DRY.
9. Without FEELING you could hurt yourself. (Burn yourself, freeze yourself, or cut yourself and not know it.)

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LESSON 6

"Some Things are Living"
"Some Things are not Living"
"Things and More Things"

(Textbook supplement - 40 -- 49)

MAIN IDEAS:

- Living things, eat, move and grow.
- There are differences in living and non-living things.
- Objects may be classified as living or non-living.

OBJECTIVES:

-- To observe and describe properties of living things.
-- To identify living things shown in pictures.
-- To differentiate between living and non-living things.
-- To classify as living and non-living.

KEY WORDS:

TASTE
SWEET
EAT
SMOOTH
ALIVE
PLANTS
SOIL
SEEDS
PROPERTY
SOUR
TOUCH
BUMPY
NON-LIVING
LEAVES
AIR
ANIMALS
LOOK
SALTY
SIZE
HOT
MOVE
STEMS
PLANTS
ROOTS
SMELL
IDENTIFY
SHAPE
WET
GROW
WATER
FOOD
BITTER
COLD
ROUGH
DRY
SUGAR CRYSTALS
MINERALS
CARBON DIOXIDE

REVIEW:

1. Things don't always TASTE the way they LOOK or SMELL.
2. PROPERTIES of TASTE are BITTER, SWEET, SOUR, and SALTY.
3. Sometimes you can't IDENTIFY the food by TASTE alone.
4. Food doesn't TASTE good when you have a COLD because you can't SMELL it.
5. Never TASTE or EAT anything if you don't know what it is or where its been.
6. TOUCH is like a "detective" because we can find out about the SIZE and SHAPE of things.
7. PROPERTIES of TOUCH are: ROUGH, SMOOTH, BUMPY, HOT, COLD, WET, and DRY.
8. Without TOUCH we could harm ourselves. (Cut, burn, or freeze).

MAIN POINTS: (NEW CHAPTER)

1. Everything around us is either ALIVE or NON-LIVING.
2. You are ALIVE and you can MOVE (a table is NON-LIVING and cannot MOVE by itself.)
3. PROPERTIES of LIVING things are that they EAT, MOVE by themselves, and GROW.
4. Some NON-LIVING things can move, but they cannot move on their own. (Rock can roll down a hill).
5. SUGAR CRYSTALS can GROW and get bigger (but SUGAR CRYSTALS are NON-LIVING).
6. PLANTS move (the LEAVES and STEMS move to get the sunlight).
7. PLANTS make their own FOOD (WATER and MINERALS from the SOIL, along with CARBON DIOXIDE from the AIR and sunshine go together to make the PLANT'S FOOD.)
8. People "rob" the PLANTS of their FOOD when we eat them. (We take the LEAVES off of the lettuce PLANT. When we eat a carrot or beet -- which is "stored-up" FOOD for that PLANT -- An apple is "stored-up" FOOD for the tiny apple SEEDS.)
9. ANIMALS may eat PLANTS or other ANIMALS that have eaten PLANTS.
10. FOOD is usually stored in PLANTS in the LEAVES, ROOTS, and SEEDS.

LESSON 7

"Living Things Grow and Change"

(Textbook supplement - 50 -- 53)

MAIN IDEAS:

- Living things grow and change.

OBJECTIVES:

-- To generalize and state that living things grow and change.
-- To identify people as living beings.

KEY WORDS:

LIVING MOVE EAT GROW NON-LIVING
PLANT LEAVES FLOWERS SUNLIGHT FOOD PLANTS PLANT SEED MOVE
WATER MINERALS GAS AIR CARBON DIOXIDE
FRUITS VEGETABLES CLASSIFY PROPERTY CHANGE
REACT LIGHT SMELL SOUND HEAT
TOUCH CHEMICALS ACID BREATHE OXYGEN
WASTE REPRODUCE DIE LIFETIME

REVIEW:

1. All LIVING things MOVE by themselves.
2. All LIVING things EAT.
3. All LIVING things GROW.
4. NON-LIVING things can't MOVE by themselves.
5. NON-LIVING CRYSTALS can GROW (only with help)
6. PLANT LEAVES and FLOWERS MOVE to get the SUNLIGHT.
7. Some PLANT SEEDS MOVE. (A "jumping bean" is a true bean but inside of that bean is a little worm. When the worm moves around, the bean moves and "jumps").
8. PLANTS make FOOD from SUNLIGHT, WATER, MINERALS, and GAS (CARBON DIOXIDE) out of the AIR.
9. People take the PLANT'S FOOD for themselves when they eat FRUITS and VEGETABLES.
10. To CLASSIFY means to put things in groups which have something in common.

MAIN POINTS:

1. Another PROPERTY of LIVING things is to CHANGE.
2. CHANGE means: when something is different than it used to be.
3. Some things CHANGE by growing bigger. (Egg turns into chick; chick grows into chicken in just a few weeks.)
4. All living things REACT to LIGHT, SMELL, SOUND, HEAT, TOUCH and CHEMICALS (ACID) around them.
5. All LIVING things BREATHE. (PLANTS take in GAS and give out OXYGEN).
6. All LIVING things get rid of WASTE.
7. All LIVING things REPRODUCE. (REPRODUCE means: they make others like themselves)
8. All LIVING things will DIE sometime. (The LIFETIME of things vary).

LESSON 8

"Many Kinds of Animals"

(Textbook supplement - 54 -- 57)

MAIN IDEAS:

- Animals have many observable properties.
- There are many different kinds of animals.

OBJECTIVES:

-- To compare animals and identify their similarities and differences.

KEY WORDS:

CHANGE
BREATHE
ANIMALS
INSECTS
DOLPHINS
LIVING
DIE
MOVE
SPIDERS
AIR
PROPERTY
REPRODUCE
EAT
FISH
WATER
SURROUNDINGS
GROUPED
DRINK
GILLS
WASTE
PLANTS
GROW
FINS

REVIEW:

1. CHANGE is "becoming different than it was".
2. Most LIVING things get "bigger" as time goes by.
3. CHANGE is a PROPERTY of all LIVING things.
4. Most LIVING things react to their SURROUNDINGS.
5. All LIVING things BREATHE, get rid of WASTE, REPRODUCE and DIE.

MAIN POINTS: (NEW CHAPTER)

1. All LIVING things can be GROUPED into: ANIMALS and PLANTS.
2. People use farm ANIMALS in some way.
3. All ANIMALS MOVE, EAT, DRINK, And GROW.
4. All INSECTS have 6 legs.
5. All SPIDERS have 8 legs.
6. FISH have GILLS and FINS.
7. DOLPHINS BREATHE AIR and must come to the surface of the WATER.

LESSON 9:

"Classroom Animals"
"Animals Move"
"Animal Tracks"

(Textbook supplement - 58 -- 63)

10-10-10-10

MAIN IDEAS:

- Animals in a classroom aquarium have many interesting properties that can be observed.
- Animals move in different ways.
- Animals move by swimming, walking, running, crawling, flying, and jumping.
- Animals may be identified by the tracks they make.

OBJECTIVES:

-- To assist in the construction of an aquarium.
-- To observe and describe the animals in the aquarium.
-- To identify ways in which different animals move.
-- To generalize and state that sometimes when animals move they make tracks.
-- To observe and match some animal's tracks to the animal that made them.

KEY WORDS:

ANIMALS	MOVE	EAT	GROW	INSECTS
SPIDERS	FISH	GILLS	FINS	LIVING
ANIMALS	BIRDS	WINGS	DOLPHINS	MAMMALS
AIR	WATER	PORPOISES	FLIPPERS	SNAKES
MUSCLES	AQUARIUM	OXYGEN	CHLORIDE	GUPPIES
SNAILS	ALGAE	TERRA	PLANTS	WATER ANIMALS
TERRARIUM	CATEPILLAR	CHANGE	BUTTERFLY	TRACKS

REVIEW:

1. All ANIMALS MOVE, EAT and GROW.
2. All INSECTS have 6 legs.
3. All SPIDERS have 8 legs.
4. FISH MOVE about by using FINS.
5. INSECTS are a type of LIVING ANIMAL.
6. BIRDS MOVE about by flying with WINGS.
7. DOLPHINS are MAMMALS and breathe AIR at the surface of the WATER.
8. DOLPHINS and PORPOISES MOVE about with the aid of FLIPPERS.
9. SNAKES MOVE about by using their stomach MUSCLES.

MAIN POINTS:

1. A place for WATER ANIMALS to live is an AQUARIUM.
2. FISH breathe with OXYGEN in the WATER through their GILLS.
3. AQUARIUM WATER must be free of CHLORINE.
4. GUPPIES are tiny FISH that can easily live in an AQUARIUM.
5. SNAILS eat the ALGAE on the AQUARIUM glass.
6. TERRA is a LATIN word for "ground".
7. TERRARIUM is a place where PLANTS can live.
8. ANIMALS can MOVE in many ways.
9. A crawling CATERPILLAR will CHANGE into a flying BUTTERFLY.
10. SNAILS can float around in WATER.
11. ANIMALS leave different TRACKS.

LESSON 10:

"Animals Need Food"
"Animal Body Coverings"
"Finding Out About An Animal"

(Textbook supplement - 64 -- 71)

MAIN IDEAS:

- All animals need food.
- Animals get food in different ways.
- Animals have many different kinds of body coverings.
- Food, water, and shelter are the basic needs of animals.

OBJECTIVES:

-- To identify food as a need common to all animals.
-- To observe and describe different ways animals obtain food.
-- To identify and describe different body coverings such as scales, feathers, and hair.
-- To identify protection as one function of body coverings.
-- To identify food, water, and shelter as needs of an animal kept in a classroom.

KEY WORDS:

AQUARIUM
RUNNING
CRAWLING
GIRAFFE
HUMAN BEINGS
GRASSHOPPER
MOSQUITO
WARM BLOODED ANIMAL
QUILL
WET
PROTECTIVE COLORATION
TERRARIUM
ANIMAL
SWIMMING
INSECTS
MOUTH
BUTTERFLIES
BLOOD
PROTECTED
HEAT
DRY
PLANTS
JUMPING
FLOATING
LIONS
CHEW
BEAK
MOUTH PARTS
FUR
SKIN
COLOR
OXYGEN
HOPPING
TRACKS
TIGERS
SUCK
FROG
TEETH
SCALES
FEATHERS
CAMOUFLAGE
WALKING
ROLLING
ENERGY
WOLVES
TUBE
TONGUE
TEAR
SHELL
COLD

REVIEW:

1. AQUARIUM is a "fish tank" that can be easily built.
2. TERRARIUM is a container where PLANTS can grow.
3. Don't put too much ANIMAL life into an AQUARIUM.
4. Use live PLANTS in the AQUARIUM to produce OXYGEN in the water.
5. ANIMALS can move by WALKING, RUNNING, JUMPING, HOPPING, ROLLING, CRAWLING, SWIMMING, and FLOATING.
6. When ANIMALS move they leave TRACKS.

MAIN POINTS:

1. All ANIMALS must eat for ENERGY.
2. ANIMALS eat PLANTS or other ANIMALS.
3. A GIRAFFE is a tall PLANT eater.

MAIN POINTS (continued):

4. Many INSECTS eat other INSECTS.
5. LIONS, TIGERS, and WOLVES eat only other ANIMALS.
6. HUMAN BEINGS eat both PLANTS and ANIMALS.
7. ANIMALS have different kinds of MOUTHS.
8. Some MOUTHS CHEW and some SUCK their FOOD.
9. GRASSHOPPERS have good MOUTH PARTS to observe.
10. BUTTERFLIES send down a TUBE into a flower and SUCK out the FOOD.
11. Birds have BEAKS and peck their FOOD.
12. FROGS shoot out their TONGUES and eat INSECTS.
13. MOSQUITOS SUCK BLOOD and eat PLANT juices.
14. A MOSQUITO that lays eggs needs to have BLOOD from a WARM BLOODED ANIMAL.
15. INSECTS that eat other INSECTS SUCK the juices out of the inside of the INSECT. (They have MOUTH PARTS that "penetrate" into the INSECT and then take the liquid part of that INSECT out).
16. ANIMALS that have TEETH can take large things and CHEW and TEAR it up.
17. ANIMALS are PROTECTED from being eaten by FUR, SCALES, SHELL, QUILL, tough SKIN, and FEATHERS.
18. ANIMALS are PROTECTED from HEAT and COLD by their coverings.
19. Some ANIMALS need to stay WET while others need to stay DRY.
20. Some ANIMALS change COLOR during parts of the year. (PROTECTIVE COLORATION or CAMOUFLAGE)

LESSON 11:

"Animals live in Many Places"
"Animals have the same Needs"

(Textbook supplement - 72 -- 77)

MAIN IDEAS:

- Animals live in many places.
- All animals have the same basic needs.
- Animals meet these basic needs in different ways.

OBJECTIVES:

-- To identify animals that live in cold places and hot places and on land and in water.
-- To identify food and a place to live as needs of all animals.
-- To generalize and state how different kinds of animals meet their needs.

KEY WORDS:

ANIMALS
BEARS
FROGS
DRY
FISH
DUCKS
LIZARDS
WARM BLOODED ANIMALS
ENERGY
MOUTHS
TONGUE
LAND
WATER ANIMALS
INSECTS
DESERT
PLANTS
BIRDS
HOT
WATER
CLAMS
HATCH
PENGUINS
REINDEER
CANNIBALISM
PROTECTION
COLD
TAME
SNAILS
CLIMATES
POLAR BEARS
SHELTER
MEAT
BEAKS
WET
WILD
TOADS
SNAKES
SEALS
FOOD

REVIEW:

1. ANIMALS eat to turn FOOD into ENERGY for moving about and keeping warm.
2. ANIMALS eat PLANTS or other ANIMALS.
3. If a person eats another person it's called CANNIBALISM.
4. Most of the big "cat" family are MEAT eaters.
5. BEARS eat both PLANTS and ANIMALS.
6. People eat both PLANTS and ANIMALS.
7. There are different types of MOUTHS.
8. BIRDS have BEAKS.
9. FROGS have TONGUES.
10. ANIMALS have "body coverings" for PROTECTION from enemies and from HOT and COLD..... DRY or WET conditions.

MAIN POINTS:

1. Some ANIMALS live on LAND and some live in WATER.
2. Some ANIMALS live in a combination of places.
3. There are TAME and WILD ANIMALS living around South Bend.
4. BIRDS are mainly LAND ANIMALS.
5. FISH are WATER ANIMALS.
6. CLAMS, SNAILS are WATER ANIMALS; TOADS and FROGS are LAND and WATER ANIMALS.
7. DUCKS can live on LAND, WATER, and in the AIR.
8. Lots of INSECTS spend lots of time in WATER, then they HATCH out and live on LAND.
9. ANIMALS and INSECTS have been found to live all over the world in many CLIMATES.
10. SNAKES and LIZARDS live in the DESERT and are WARM BLOODED ANIMALS.
11. PENGUINS and POLAR BEARS, REINDEER, and SEALS can live in very cold CLIMATES.
12. All ANIMALS need a place to live. (SHELTER)
13. All ANIMALS need FOOD to eat and WATER to drink.
14. A real problem in today's world is that man is destroying the places where they live....or destroying their food. Lots of ANIMALS are having a very hard time finding places to live.

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LESSON 12

"Different Kinds of Weather"
"There are many kinds of Weather"

(Textbook supplement - 78 -- 83)

MAIN IDEAS:
- Weather is the condition of the atmosphere at one place and time.
- There are many different kinds of weather conditions.

OBJECTIVES:

-- To observe and describe the weather on a given day.
-- To observe and identify different kinds of weather.

KEY WORDS:

ANIMALS
LAND
WATER
AIR
DEER
DOGS
HORSES
CATS
COWS
WATER ANIMALS
FISH
CLAMS
STARFISH
TURTLES
FROGS
DUCKS
SPARROW
ROBIN
CROWS
INSECTS
HOT
COLD
DESERT ANIMALS
LIZARDS
CAMELS
PRAIRIE DOGS
SNAKES
BIRDS
BLOOD SYSTEM
COLD BLOODED
POLAR BEAR
PENGUINS
SEALS
REINDEER
TROPICS
ELEPHANTS
JAGUARS
FOREST
SUN
FOOD
WEATHER
FOG
PARTICLES
WINDY
EARTH
WARMTH
PREPARED
DRY
STORMY
METAL
LIGHTNING STORMS

REVIEW:

1. Most ANIMALS live either on LAND or WATER.....but some live in the AIR part of the time.
2. ANIMALS that live on land are DEER, DOGS, HORSES, CATS, COWS, etc.
3. Some WATER ANIMALS are FISH, CLAMS, STARFISH, etc.
4. TURTLES, FROGS, DUCKS are ANIMALS that live part of the time on LAND and in the WATER.
5. DUCKS can live on LAND, swim in the WATER and fly in the AIR. (But the very best place for DUCKS is in the AIR).
6. SPARROWS, ROBINS, and CROWS don't live anytime in the WATER.
7. Some INSECTS begin their life in WATER and come onto the LAND.
8. Some ANIMALS like it where it's HOT......and some ANIMALS like it COLD.
9. Some DESERT ANIMALS are LIZARDS, CAMELS. PRAIRIE DOGS, SNAKES, some BIRDS. (LIZARDS and SNAKES have to live where it's very WARM because they have a different type of "BLOOD SYSTEM"......they are COLD BLOODED and can live only where it's WARM.)
10. Some ANIMALS like to live where it's quite COOL.....POLAR BEARS, PENGUINS, SEALS, REINDEER and relatives of the DEER.
11. Some LAND ANIMALS like to live in the TROPICS where it's quite WARM....like ELEPHANTS and JAGUARS.
12. Wherever ANIMALS live, they need a place to live, FOOD to eat, and WATER to drink.
13. Some ANIMALS don't drink WATER, but take their WATER in the FOOD they eat.
14. In fairly recent times, people have been cutting down FORESTS and other places where ANIMALS live. (Many ANIMALS have died off as a result of this).

MAIN POINTS: (NEW CHAPTER)

1. WEATHER is what it's like outside.
2. FOG is tiny PARTICLES of WATER in the AIR.
3. The SUN heats things and gives WARMTH to the EARTH.
4. We have to be prepared for the WEATHER. (Dress right to keep WARM and DRY; get inside during WINDY and STORMY times).
5. Don't get around anything that's METAL during LIGHTNING STORMS.

LESSON 13

"Effects of Weather"
"Weather Changes"
"Making a Weather Chart"

(Textbook supplement - 84 -- 91)

MAIN IDEAS:

- Weather can influence our dress and activities.
- When the weather changes, it affects our activities.

OBJECTIVES:

-- To describe appropriate clothing for different weather conditions.
-- To describe appropriate activities for certain kinds of weather.
-- To observe and describe ways weather changes affect our activities.

KEY WORDS:

WEATHER
RAINY
SUN
WINTER
WOOL
COLD
FOGGY
HEAT
THUNDERSTORM
WINDSTORM
HOT
WINDY
COOLER
RAINING
SNOWING
SNOWY
STORMY
SUNBURNED
WARMLY
WEATHER REPORT
SUNNY
SLEET
GREENHOUSES
DRY

REVIEW:

1. WEATHER is what it's like outside.
2. Types of WEATHER: COLD, HOT, SNOWY, SUNNY, RAINY, FOGGY, WINDY And STORMY. (SLEET)
3. Most people like SUNNY days.
4. The SUN gives us HEAT. (Walk barefoot on the sidewalk and it will be HOT in the SUN.....in the shade, things will be cooler.)
5. You can get SUNBURNED from the SUN.
6. GREENHOUSES are WARM from the SUN.
7. You can feel that it's WARMER when the SUN shines in through a window during the WINTER.

MAIN POINTS:

1. During a THUNDERSTORM, if you are outside in an open field, stay away from the highest thing especially things made of metal.
2. When it's RAINING, stay out of a swimming pool.
3. Stay away from a fence during a THUNDERSTORM.
4. Always remember to dress WARMLY on a cold day. (Cover your head,hands, and feet).
5. Keep your clothes DRY when it gets COLD. (WOOL is a good protector from the COLD).
6. When it gets COLD you want to do something that keeps you active.
7. During a WINDSTORM, get inside or go to a basement. If you don't have a basement, get under a desk or a table.

8. During HOT and SUNNY days, dress to keep COOL. Wear clothing so you won't get SUNBURNED. (HAT for head protection.....sunglasses for eye protection, etc).
9. On a COOL RAINY day, it's important to keep yourself DRY and WARM. (Keep your feet DRY so you won't get a "cold")
10. If you are outside when it's FOGGY or SNOWING heavily, be careful not to get hit by a car.
11. Listen to the WEATHER REPORT to help decide what to wear.

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LESSON 14

"Air Is All Around Us"
"Evidence of Air"

(Textbook supplement - 92 -- 99)

MAIN IDEAS:

- We are surrounded by an invisible blanket of air.
- Moving air can be felt, and so is directly observable through the sense of touch.
- Air can be observed indirectly through the senses of sight, hearing, and smell.
- Air can move objects by pushing them.
- Air takes up space.

OBJECTIVES:

-- To identify wind as moving air.
-- To observe air directly with the sense of touch.
-- To observe air indirectly with the senses of sight, hearing and smell.
-- To demonstrate that air can make objects move.
-- To demonstrate that air takes up space.

KEY WORDS:

WEATHER
COLD
NOSE
SNOWING
SMELLS
RAINY
THUNDERSTORM
AIR
FOGGY
SMOKE
SNOWY
LIGHTNING
LUNGS
CHART
MOVE
WINDY
TV
SUMMER
SOUND
HOT
WARM
WINTER
WEATHER REPORT

REVIEW:

1. WEATHER is what it's like outside.
2. Types of WEATHER: RAINY, SNOWY, WINDY, HOT, COLD.
3. Never stand under a tree or anything tall during a THUNDERSTORM.
4. During a THUNDERSTORM, go into your house, and get out of the LIGHTNING.
5. During a bad THUNDERSTORM, don't sit inside next to a TV because LIGHTNING could strike the electrical wires and come into your TV set.
6. Make sure you wear something WARM during the real COLD days. Protect your head, hands, and feet).

7. Breathe through your NOSE during real COLD days. (This WARMS the AIR before it reaches your LUNGS.)
8. Make sure you don't get too WARM during HOT SUNNY days.
9. Protect your eyes on BRIGHT days (both SUMMER and WINTER days).
10. Dress properly for the kind of WEATHER you are having.
11. If it's SNOWING hard or FOGGY, stay away from the street.
12. People listen to the WEATHER REPORT so they can plan their day and know what kind of clothing to wear.
13. Make a CHART and keep track of the WEATHER.

MAIN POINTS: (NEW CHAPTER)

1. SOUND travels through AIR.
2. SMELLS travel through the AIR.
3. AIR moves SMOKE.
4. AIR makes things MOVE.

LESSON 15

"Air Can Fill Things"
"Living Things Need Air"

(Textbook supplement - 100 -- 105)

MAIN IDEAS:

- Air can be put into some objects.
- Air can make inflated objects feel soft or hard.
- Some inflated objects can support heavy objects.
- Most living things need air.
- People use air in many different ways.

OBJECTIVES:

-- To fill various objects with air.
-- To describe how inflated objects feel.
-- To state that air can support heavy objects.
-- To generalize and state that most living things need air.
-- To identify different ways that people use air.

KEY WORDS:

AIR
FOOTBALL
SOFT
KITE
FISH
MOVE
BASKETBALL
PILLOW
METEORS
WATER GILLS
SOUND
RAFT
MATTRESS
GAS
CARBON DIOXIDE
SMELL
PLASTIC BAG
HARD
OXYGEN
BALLOON
SHAPE
PRESSURE
LEAVES

REVIEW:

1. AIR has no color.
2. AIR is all around us.
3. AIR has no shape.
4. AIR has no smell.
5. You use AIR all the time.
6. You can't see AIR.
7. AIR takes up space.
8. AIR makes things MOVE.
9. SOUND travels through the AIR.
10. SMELLS travel through the AIR.

MAIN POINTS:

1. AIR will fill up a BALLOON, FOOTBALL, BASKETBALL, RAFT, PLASTIC BAG....and you fill up your LUNGS with air.
2. AIR can take any SHAPE of whatever it's in.
3. Sometimes we put AIR into things to make them SOFT: RAFT, PILLOW, MATTRESS.
4. Sometimes we put AIR into things to make them HARD: FOOTBALL,BASKETBALL, (AIR is put in under PRESSURE).
5. We have AIR pushing on us all the time.
6. Whenever you fly a KITE, AIR is pushing on the KITE.
7. AIR slows things down when they drop. (METEORS burn up in the AIR)
8. Everything that's living needs AIR. (OXYGEN) (GAS)
9. Plants need AIR. (CARBON DIOXIDE) (GAS)
10. LEAVES take in CARBON DIOXIDE.
11. FISH take in AIR out of the WATER. (GILLS take the AIR out of the WATER--OXYGEN)

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LESSON 16

"Clean Air and Dirty Air"

(Textbook supplement - 106 -- 111)

MAIN IDEAS:

- Air sometimes carries many solid particles.
- Some human activities cause air pollution.

OBJECTIVES:

-- To collect solid particles from the air and describe them.
-- To generalize and state ways to help keep air clean.

KEY WORDS:

AIR
PRESSURE
GAS
LEAVES
INVISIBLE
VOLCANOES
FOG
HARD
AIRPLANES
NITROGEN
FISH
PARTICLES
ERUPTED
POLLUTION
TIRES
KITES
CARBON DIOXIDE
GILLS
EXHAUST
ASH
SOFT
BIRDS
ARGON
WATER
SMOKING
SNOW
MATTRESSES
OXYGEN
PLANTS
HYDROGEN
NATURE
RAIN

REVIEW:

1. AIR can fill things and take up space.
2. AIR can make things HARD. (TIRES)
3. AIR can make things SOFT. (MATTRESSES)
4. AIR can be forced into spaces under PRESSURE.
5. AIR is all around us under a little PRESSURE.

MAIN POINTS:

1. AIR helps hold AIRPLANES, KITES and BIRDS up.
2. All living things need AIR. (OXYGEN) (GAS)
3. AIR is made up of many GASES --- NITROGEN, OXYGEN, CARBON DIOXIDE, and ARGON.
4. All PLANTS needs CARBON DIOXIDE out of the AIR.
5. PLANTS take the CARBON DIOXIDE from the LEAVES.
6. FISH get OXYGEN through its GILLS. (WATER is made up of HYDROGEN and OXYGEN.)
7. AIR is INVISIBLE (but has little PARTICLES of many things put there by man -- EXHAUST from cars — people SMOKING; NATURE can put things in the AIR -- SMOKE from forest fires -- VOLCANOES ERUPTED and sends ASH into the AIR -- SNOW colors the AIR; RAIN.....FOG.....POLLUTION)

LESSON 17

"Finding Water"
"Water Can Change"

(Textbook supplement - 112 -- 121)

MAIN IDEAS:

- There are many ways that people can have fun with water.
- Water can be found in many places.
- When water evaporates it goes into the air.
- We cannot see the water in the air but it is there.

OBJECTIVES:

-- To describe ways that people can have fun with water.
-- To name places where water can be found.
-- To generalize and state that when water evaporates it goes into the air.
-- To generalize and state that water is in the air even though it cannot be seen.
-- To identify ice as a form of water.

KEY WORDS:

AIR
SUNSET
CONTAINER
OCEAN
EVAPORATE
INVISIBLE
COLOR
MOVE
RIVERS
VAPOR
PARTICLES
WATER
FUN
STREAMS
POLLUTION
TRANSPARENT
PONDS
EARTH
NATURE
SHAPE
LAKE
WATER

REVIEW:

1. AIR is INVISIBLE.
2. AIR seems to have color because of tiny PARTICLES of POLLUTION.
3. Sometimes NATURE puts tiny PARTICLES into the AIR.
4. These PARTICLES make the SUNSET look colorful.
5. Whenever AIR has COLOR that tells us that there is something in it.
6. We should try to keep the AIR clean.
7. All living things need AIR.

MAIN POINTS:

1. You can see right through WATER. (TRANSPARENT)
2. WATER takes the SHAPE of any CONTAINER.
3. WATER can take little PARTICLES and move them around.
4. WATER can MOVE things.
5. You can have FUN with WATER. (Swimming, water skiing, bath....etc.)
6. WATER is all around us. (PONDS, LAKES, OCEANS, RIVERS, STREAMS, etc.)
7. There's more WATER than land on the EARTH.
8. All living things need WATER.
9. People need to drink clean WATER.
10. WATER will EVAPORATE (Disappears as WATER VAPOR.)

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LESSON 18

"All Living Things Need Water"
"Clean Water and Dirty Water"

(Textbook supplement - 122 -- 128)

MAIN IDEAS:

- Living things need water.
- People use water in many ways.
- Water can be wasted by using too much or by making it unclean.

21-21-21-21

OBJECTIVES:

-- To state several ways in which water is important to living things.
-- To list and discuss ways we use water.
-- To identify and describe ways that water can be wasted.
-- To identify and describe ways that water can be conserved.

KEY WORDS:

AIR
CONTAINER
LAKES
DRINKING
DESERT PLANTS
WATER
MOVE
OCEANS
EVAPORATE
SWAMP PLANTS
INVISIBLE
FUN
RIVERS
HEATED
DROUGHT
TRANSPARENT
NATURE
STREAMS
PLANTS
POLLUTED
SHAPE
POND
POLLUTED
ANIMALS

REVIEW:

1. AIR and WATER are similar. (AIR is INVISIBLE; WATER is TRANSPARENT)
2. WATER takes the SHAPE of any CONTAINER.
3. WATER makes things MOVE.
4. The next most important thing besides AIR is WATER.
5. You can have FUN with WATER. (Swimming, fishing, water skiing...etc.)
6. WATER will come out of the faucet at home.
7. WATER in NATURE can be found in PONDS, LAKES, OCEANS, RIVERS, STREAMS and WELLS.
8. Dirty WATER is POLLUTED and unsafe for DRINKING.
9. WATER will EVAPORATE.

MAIN POINTS:

1. WATER by a hot radiator will EVAPORATE quickly.
2. WATER by a window will EVAPORATE slowly. (AIR will help it to EVAPORATE.)
3. WATER will EVAPORATE quickly if it is HEATED and MOVED by AIR.
4. ALL living things need WATER. (PLANTS and ANIMALS)
5. Not all living things need the same amount of WATER.
6. DESERT PLANTS and ANIMALS need very little WATER.
7. SWAMP PLANTS and ANIMALS need lots of WATER.
8. When we don't have enough WATER for the PLANTS and ANIMALS in a given area we call that a DROUGHT.
9. People use WATER in many ways: drink, brush teeth, wash dishes, washing clothes, fixing food, scrub the floor, wash windows, flush toilet, wash glasses.....etc.
10. Every person uses a great deal of WATER every day.
11. ANIMALS cannot drink dirty, POLLUTED water.

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LESSON 19

"Observing Plants and Seeds"

(Textbook supplement - 132 -- 135)

MAIN IDEAS:

- Similarities and differences exist among plants.
- Each seed that grows will develop into the same kind of plant from which it came.

OBJECTIVES:

-- To observe and describe the variation among seeds and plants.
-- To state that a seed develops into the same kind of plant from which it came.

KEY WORDS:

AIR WATER PLANTS ANIMALS DROUGHT
FUN POLLUTED LEAVES SEEDS FLOWER
PROTECTED FRUIT GREEN PEPPER TOMATOES CUCUMBERS
VEGETABLES.

REVIEW:

1. Next to AIR, the most important thing is WATER. (PLANTS and ANIMALS)
2. All living things need WATER.
3. Not all PLANTS and ANIMALS need the same amount of water.
4. When we don't have enough WATER we can have a DROUGHT.
5. Some PLANTS and ANIMALS may die in a DROUGHT.
6. People use water lots of ways.
7. Always use water and wash your hands before we eat or after going to the bathroom.
8. WATER can be used for FUN. (Swimming, fishing, water skiing....etc.)
9. Never drink WATER unless you know it's safe to drink. (Even clear looking WATER can be POLLUTED.)

MAIN POINTS: (NEW CHAPTER)

1. Most PLANTS are green and have LEAVES.
2. The LEAVES of PLANTS are different (even on the same plant).
3. All PLANTS are not alike.
4. Most PLANTS are grown from SEEDS.
5. To have a SEED you must have a FLOWER.
6. SEEDS are PROTECTED by the FRUIT of the PLANT.
7. SEEDS will grow a new PLANT.
8. GREEN PEPPERS, CUCUMBERS and TOMATOES are really FRUITS (Not VEGETABLES)

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LESSON 20

"What Is In A Seed?"
"Growing Plants From Seeds"

(Textbook supplement - 136 -- 141)

MAIN IDEAS:

- A seed contains both food and embryo from which a new plant may grow.
- Roots, stems, and leaves are formed during the development of seedlings.
- Seeds germinate at different rates.

OBJECTIVES:

-- To observe and compare dry and soaked seeds.
-- To describe what is inside a seed.
-- To observe and identify the roots, stem and leaves of seedlings.
-- To state that seeds grow at different rates.

KEY WORDS:

LEAVES	PLANTS	EVERGREEN	SEEDS	FRUIT
EMBRYO	MAGNIFYING GLASS	SEED COAT	HOT	MOISTURE
WATER	BEAN PLANT	BEAN SEEDS	WARM	DARK

REVIEW:

1. The LEAVES of PLANTS are different (even on the same plant.)
2. EVERGREEN (always green) trees keep their "needle-like" leaves all year round.
3. SEEDS are found inside the FRUIT of most PLANTS.

MAIN POINTS:

1. Use a MAGNIFYING GLASS to study SEEDS closely. (EMBRYO- "baby PLANT" can be found inside each SEED; some with 1 LEAF....some with 2 LEAVES).
2. Don't get SEEDS too HOT or it will kill the EMBRYO. (Seed Coat will protect the little PLANT inside the SEED.)
3. SEED COAT protects it from drying out, or getting too cold, or too much or too little MOISTURE (WATER)
4. A BEAN PLANT will grow 1 or 2 inches a day.
5. BEAN SEEDS will grow best where it's fairly WARM and pretty DARK (at least the 1st week).

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LESSON 21

"Growing Plants For Food"
"Growing Plants Without Seeds"

(Textbook supplement - 142 -- 148)

25-25-25-25

MAIN IDEAS:

- Trees are plants.
- There are many different kinds of plants.

OBJECTIVES:

-- To identify the parts of a tree.
-- To observe and describe similarities and differences among plants.

KEY WORDS:

MUSHROOMS
SPORES
PLANTS
ROOTS
UNDERGROUND
ABOVE GROUND
HAIRS
WATER
MINERALS
STEMS
LIGHT
CLAY POTS
MOISTURE
CUTTINGS
SEEDS
TREE SEEDS
WALNUTS
PECANS
HAZEL NUTS
MAPLE SEEDS
ACORNS
FLOUR
LEAVES
TRUNK
FOOD
BRANCHES
TREES
TEMPERATURE
PLANTS

REVIEW:

1. MUSHROOMS grow from SPORES (but it is still a PLANT).
2. A PLANT has more growing UNDERGROUND that you can see ABOVE GROUND. (ROOTS)
3. ROOTS are small like HAIRS.
4. If you could measure all the ROOTS of a big tree you would find several hundred miles of ROOTS are UNDERGROUND.
5. ROOTS reach downward toward the WATER and MINERALS; STEMS reach upward to get the LIGHT.

MAIN POINTS:

1. CLAY POTS hold lots of MOISTURE.
2. Some PLANTS can grow from CUTTINGS.
3. TREES are the biggest PLANTS that we know.
4. TREES grow from SEEDS.
5. You can eat some TREE SEEDS (WALNUTS, PECANS, HAZEL NUTS).
6. MAPLE SEEDS have little "wings" that let them travel distances.
7. Indians used ACORNS for making FLOUR.
8. There are 4 main parts to a tree: ROOTS, anchor plant to the ground and supply WATER and MINERALS. LEAVES make the food. TRUNK moves the FOOD up and down. BRANCHES hold the leaves on.
9. TREES can be identified by the shape of the LEAVES.
10. PLANTS need a certain type of TEMPERATURE in order to live.

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24-24-24-24

MAIN IDEAS:

- Many foods are grown from seeds.
- Light and water are necessary for normal plant growth.
- Some plants may reproduce by means other than seeds.

OBJECTIVES:

-- To identify foods grown from seeds.
-- To generalize and state that light and water are necessary for normal plant growth.
-- To state that new plants may grow from parts of plants other than seeds.

KEY WORDS:

EMBYRO
HARD
VEGETABLES
MUSHROOMS
PLANT
SEED COAT
CANNED
SPORES
SEED
BEAN
FROZEN
WATER
EMBRYO'S FOOD
DRY FRUITS
DRY SEEDS
FRUITS
VITAMINS

REVIEW:

1. EMBRYO is the "baby PLANT" inside the SEED.
2. All SEEDS look different.
3. SEEDS that have been soaked in WATER were soft; DRY SEEDS are HARD.
4. The SEED COAT protects the PLANT that's inside the BEAN.
5. Most of the material that's inside the SEED is the EMBRYO's FOOD.
6. Some SEEDS have been good after 2000 years. (In Egypt's tombs).

MAIN POINTS:

1. Most of our FRUITS and VEGETABLES grow on PLANTS.
2. You can keep FRUITS and VEGETABLES fresh for a long period if they are CANNED or FROZEN. (You can DRY FRUITS and VEGETABLES to keep for a long period of time.)
3. Most VEGETABLES are better to eat if uncooked (more VITAMINS).
4. MUSHROOMS grow from SPORES (not SEEDS) .

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LESSON 22

"Trees Are Plants"
"Similarities and Differences In Plants"

(Textbook supplement - 149 -- 157)

LESSON 23

"Where Are Rocks Found?"
"Properties of Rocks and Their Uses"

(Textbook supplement - 158 -- 166)

MAIN IDEAS:

- Rocks are found in many places.
- Rocks differ from each other in certain physical properties.
- People use rocks in many different ways.

OBJECTIVES:

-- To describe places where rocks may be found.
-- To observe and describe certain physical properties of rocks.
-- To list some ways people use rocks.

KEY WORDS:

TREES
MICROSCOPE
LEAVES
FOOD
BANANAS
HAND LENS
STREAMS
PLANTS
ORCHID
SUNLIGHT
TEMPERATURE
WATER LILIES
SAND
RIVERS
SEEDS
ROOTS
BRANCHES
PLACE
CACTUS PLANTS
EARTH
HARD
MAPLE
WATER
TRUNK
GROW
DRY
SOIL
COCONUT
MINERALS
STEM
PALM TREES
ROCKS
LAVA

REVIEW:

1. TREES are the biggest PLANTS that grow.
2. TREES begin as SEEDS.
3. Some SEEDS look like helicopters. (MAPLE)
4. The biggest SEED is a COCONUT.
5. Some SEEDS are so tiny you need a MICROSCOPE in order to see them. (ORCHID)
6. ROOTS anchor the PLANT into the ground and get WATER and MINERALS.
7. LEAVES make the FOOD from the SUNLIGHT, WATER and MINERALS.
8. BRANCHES spread the LEAVES about.
9. TRUNK, or STEM carries the WATER and MINERALS up to the LEAVES, and the FOOD moves down to the ROOTS.
10. The 4 main parts of a TREE: ROOTS, TRUNK, BRANCHES and LEAVES.
11. There are many different kinds of LEAVES.
12. The LEAVES on any PLANT has the job of making FOOD for that PLANT.
13. It's important that LEAVES get the right amount of SUNLIGHT.
14. All PLANTS need to have WATER, SUNLIGHT, MINERALS, proper TEMPERATURE, and a PLACE to GROW.
15. PALM TREES and BANANA TREES need to grow where it's WARM.
16. WATER LILIES grow where there's lots of WATER.
17. CACTUS PLANTS grow where it's DRY.

MAIN POINTS: (NEW CHAPTER)

1. To study ROCKS you need a good HAND LENS.
2. SAND is tiny pieces of ROCKS.
3. There are ROCKS all over the EARTH.
4. There is a layer of ROCKS underneath the SOIL all over the EARTH.
5. Hot, melted ROCK is called LAVA.
6. ROCKS can be found in STREAMS and RIVERS because the SOIL has been washed away.
7. Most ROCKS are alike; they are HARD and are made of many things.
8. When ROCKS are rubbed together they make SAND.

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LESSON 24

"Finding and Looking At Soil"
"Another Look At Soil"

(Textbook supplement - 167 -- 175)

MAIN IDEAS:

- Soil can be found in many places.
- Different soils have different physical properities
- Soil may contain materials from plants and animals as well as small pieces of rock.
- Soil is used by plants and animals in many ways.

OBJECTIVES:

-- To name places where soil can be found.
-- To observe and describe some of the physical properties of soil.
-- To describe different components of soil.
-- To generalize and state some ways soil is used by plants and animals.

KEY WORDS:

HARD
EARTH
WEIGHT
CONCRETE
ANIMALS

ROCK
SHAPES
VOLCANO
COLOR
BROWN SOILS

RIVERS
SURFACES
WATER
SOILS
LIGHT BROWN SOIL

STREAMS
SMOOTH
SAND
BLACK SOIL
SOFT

GRAVEL PITS
ROUGH
MATERIAL
PLANTS
VERY LIGHT SOIL

REVIEW:

1. The whole EARTH is covered with a layer of ROCK.
2. RIVERS and STREAMS are good places to find ROCKS. (GRAVEL PITS)
3. ROCKS are all HARD but they have different SHAPES and SURFACES. (SMOOTH and ROUGH)
4. ROCKS have WEIGHT.
5. One kind of ROCK that's made by a VOLCANO can float on WATER.
6. Rubbing a couple of ROCKS together can produce SAND.
7. SOIL (MATERIAL that we can grow plants in) can be found anyplace where there wasn't WATER, CONCRETE, or ROCK.

MAIN POINTS:

1. SOILS have different COLORS.
2. BLACK SOILS contain old parts of PLANTS and ANIMALS.
3. BROWN SOILS contains a little more SAND with the PLANTS and ANIMALS.
4. LIGHT BROWN SOILS contain more SAND.
5. Very LIGHT SOILS has the most SAND in it.
6. SOIL has smell.
7. SOIL has feel to it.
8. SOIL has ROUGH and SOFT feel.
9. When SOIL is put into WATER, some of it will float and some of it will sink to the bottom. (Some of the SOIL will float in between. The heavier SAND will sink).

2ND GRADE SCIENCE

SOUTH BEND COMMUNITY
SCHOOL CORPORATION

2nd GRADE SCIENCE

FOREWORD

"2nd Grade Science" is a radio supplement of twenty-four lessons based on the adopted textbook, Heath Science, Level 2. The program format uses dialogue between the teacher, Mr. Dee, and a student, Peppy. Peppy actually is a puppet which I hope the children will identify with.* We have been very careful not to identify Peppy as male or female. In an attempt to develop programs with a fast moving pace, no script was developed and we may find Peppy from time to time being even a little mischevious.

Our primary goal was to make a series of radio lessons that are educational, somewhat entertaining and definitely supplementary to your textbooks. You will find that the guide for each lesson includes a list of KEY WORDS. These are words that may be new to the student, may be somewhat difficult for a second grader, or may be strictly scientific terms. You may want to discuss these KEY WORDS before the broadcast and even place them on the chalkboard. These words have been listed only so that special attention will be devoted to them to assure the student the fullest possible understanding of the radio lesson. You will also note that the Main Points might be brought to the attention of your students previous to listening to the lesson as a means of alerting them to listen for particular information. At other times, you may wish to use these points as a guide for discussion following the broadcast.

This series of radio lessons was produced entirely by WETL Radio. Credits are due to Laura Moran, who was the voice of Peppy, and Jerry Limbert for the excellent work he did in recording and editing the broadcast tapes and for preparing this Teacher's Manual.

I hope that you and your 2nd grade students will enjoy using these supplementary radio lessons as much as we enjoyed producing them.

Sincerely,

John V. Davis

John V. Davis (Mr. Dee)
Coordinator of Science & Health Education

*You may secure a picture of Peppy for your classroom by requesting it from Mr. Dee.

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2ND GRADE SCIENCE

LESSON 1

"Seasons"
"Fall"
"Winter"

(Textbook supplement - 1 -- 9)

MAIN IDEAS:

- Each year has four seasons.
- Fall days are shorter and cooler than summer days.
- Fall weather has direct influences on living things.
- The winter season has short and cool or cold days.
- The activities of living are affected by winter weather.

OBJECTIVES:

-- To name the four seasons of the year in order.
-- To identify and describe the seasons depicted in a picture.
-- To describe the kind of weather that is characteristic of the fall season.
-- To describe the effects of fall weather on living things.
-- To describe the kind of weather that is characteristic of the winter season.
-- To describe the effects of winter weather on living things.

KEY WORDS:

SCIENCE
LIGHT
HEAR
PLANTS
WATER
ROCKS
SEASONS
YEAR
FALL
WINTER
SPRING
SUMMER
PATTERNS
DAY
NIGHT
NUMBERS
SMELL
LEAVES
COLORS
COLD
TASTE
SOUNDS
CROPS
ANIMALS
STORING FOOD
SHELTER
BIRDS
SNOW
SEE
TOUCH
SNOWFALL
COLD WINTER

MAIN POINTS:

1. Some things in SCIENCE can be very interesting. Have you ever thought about how LIGHT comes on when you flip the LIGHT switch? How do we HEAR? How do PLANTS use WATER? How are ROCKS made?
2. The SEASONS of the YEAR are: FALL, WINTER, SPRING and SUMMER
3. There are PATTERNS to things in SCIENCE.
4. DAY and NIGHT always come in a PATTERN.
5. NUMBERS always come in a PATTERN (1-2-3-4-5-6-- etc.)
6. In FALL, there's the SMELL of LEAVES burning.
7. In FALL, the LEAVES turn COLORS.
8. In FALL, the weather turns COLDER.
9. In FALL, there's the TASTE of apple cider.
10. In FALL, there are the SOUNDS of LEAVES rustling.
11. In FALL, everybody rakes up the LEAVES· a popular game is football.

12. In FALL, the farmers bring in the CROPS; and PLANTS are covered and protected from the snow and cold temperatures.
13. Never run and jump into a pile of LEAVES that you didn't rake up yourself --- there may be some objects hidden in the LEAVES that could be dangerous.
14. In FALL, the ANIMALS are STORING FOOD and finding a place to stay (SHELTER).
15. Some BIRDS even leave the area during the WINTER.
16. The SEASON that follows FALL is called WINTER.
17. The days are short during the WINTER.
18. SNOW is one of the things we can SEE, TOUCH, and TASTE.
19. SNOW should only be eaten after a long SNOWFALL.
20. Very COLD winds can come in the WINTERTIME.
21. People need to wear special CLOTHING during the COLD WINTER.

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LESSON 2

"Spring"
"Summer"

(Textbook supplement 10 -- 19)

MAIN IDEAS:

- Spring has longer and warmer days than winter.
- Spring weather affects the activities of living things.
- The summer weather affects the activities of all living things.

OBJECTIVES:

-- To describe the kind of weather that is characteristic of spring.
-- To describe the effects of spring weather on living things.
-- To describe the kind of weather that is characteristic of the summer season.
-- To describe the effects of summer weather on living things.

KEY WORDS:

FALL
LEAVES
FOOD
WINDY
SPRING
PLANTS
GARDENS
HUMID
BIRDS SHED
SHADE
COLDER
JACK-O-LANTERN
SHELTER
HIBERNATE
WEATHER
FLOWERS
GROW
COOL
GROUND SQUIRRELS
WARMS
WINTER
FALL
SQUIRRELS
RAIN
BLOOM
HOT SUMMER
SHEEP
DOGS
RAKE
VEGETABLES
SLEDDING
GROUND HOGS
SNOW
HATCHED
BEGIN
WOOL
WATER
BURN
ANIMALS
SKATING
RABBITS
WARMER
BABY ANIMALS
AIR
SHED
ANIMALS

REVIEW:

1. In FALL, the days start to get shorter and the nights begin to get longer.
2. In FALL, the early mornings are getting COLDER but it WARMS up a little during the days.

3. People begin to RAKE and BURN their LEAVES; making JACK-O-LANTERNS, getting their houses ready for WINTER.
4. People pick fruit and bring in their VEGETABLES, getting ready for WINTER.
5. Bring outside plants inside at this time of the year.
6. Some ANIMALS store up their Food and build SHELTER for WINTER.
7. WINTER follows FALL.
8. It's fun to go SLEDDING and SKATING during the WINTERTIME.
9. In the WINTERTIME, it gets COLD and WINDY.
10. Some of the ANIMALS sleep (HIBERNATE) during the WINTER.
11. Some of the ANIMALS only come out during the WARM WINTER days (SQUIRRELS, GROUND HOGS, RABBITS.)

MAIN POINTS:

1. SPRING comes after WINTER.
2. In SPRING, the days begin to get longer and the nights shorter.
3. The WEATHER starts to get a little WARMER during the SPRING.
4. In SPRING, we get lots of RAIN that washes away the dirty SNOW.
5. PLANTS need lots of SPRING RAIN.
6. Some of the FLOWERS start to BLOOM during the SPRING.
7. SPRINGTIME is when BABY ANIMALS are born and birds are HATCHED
8. Baby birds are born in the SPRING because they need a time to develop their feathers; ANIMALS are born because they need time to develop their fur or hair.
9. We PLANT our GARDENS in early SPRING.
10. Most PLANTS need a long time to GROW.
11. SPRING is the "Starting Point" when things BEGIN.
12. People need to dress differently during the HOT SUMMER.
13. The AIR gets HUMID during SUMMER.
14. ANIMALS need to keep COOL during the HOT SUMMERTIME.
15. WOOL is removed from SHEEP to keep them COOL.
16. Some ANIMALS SHED their hair to keep COOL.
17. Some BIRDS SHED their feathers to keep COOL.
18. During the very HOT days, some ANIMALS stay in the SHADE to keep COOL and are not very active.
19. GROUND SQUIRRELS may stay in the ground for several weeks to keep COOL.
20. DOGS have lots of problems during the very HOT SUMMER days.
21. All ANIMALS need lots of WATER during the SUMMER.

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LESSON 3

"Kinds of Sounds"
"Differences In Sounds"

(Textbook supplement - 22 -- 30)

MAIN IDEAS:

- There are different kinds of sounds -- loud, soft, high and low.
- Something must vibrate to make a sound.
- The "highness" or "loudness" of sound depends on the number of times per second an object vibrates.

OBJECTIVES:

-- To identify sounds as loud, soft, high or low.
-- To observe and describe evidence of the quick motions as sound is made by objects.
-- To construct simple musical instruments.
-- To make loud and soft sounds on an instrument.

KEY WORDS:

SPRING WEATHER WARM WINDY WET
GROW ANIMALS BORN HATCHED SUMMER
COOL HOT SEASONS BIRDS SCARY
SOUNDS FALL SWIMMING JINGLE BELLS WINTER
TUNING FORK TONE STRUCK HIGHER AIR
VIBRATE SOUND WAVES MOVEMENT TIGHTER SOUND TRAVELS
LOUD SOFT SHRILL

REVIEW:

1. In SPRING, the WEATHER begins to get WARM and WINDY and WET.
2. Most things start to GROW in the SPRINGTIME.
3. Baby ANIMALS are BORN in the SPRING; Birds are HATCHED during the SPRING.
4. During SUMMER the days are longer and the nights shorter.
5. ANIMALS have ways to keep COOL during the HOT days of SUMMER.
6. Some of the little ANIMALS even hide away during the HOT days.

MAIN POINTS: (NEW CHAPTER)

1. The 4 SEASONS have SOUNDS all their own.
2. BIRDS can be heard in the SPRINGTIME.
3. SCARY SOUNDS can be heard in the FALL (Hallowe'en).
4. SWIMMING SOUNDS can be heard in the SUMMER.
5. JINGLE BELLS remind us of WINTER (Christmas).
6. TUNING FORKS can produce a TONE when they are STRUCK.
7. The smaller the FORK the HIGHER the TONE.
8. TUNING FORKS (when struck) VIBRATE and move the AIR.
9. SOUND WAVES move away from a VIBRATING TUNING FORK.
10. SOUND TRAVELS in WAVES.
11. The MOVEMENT (VIBRATIONS) cause SOUND.
12. Moving rubber bands can produce a TONE when they VIBRATE.
13. The TIGHTER something is stretched, the HIGHER the TONE.
14. For there to be SOUND, there has to be VIBRATIONS (something must be MOVING).
15. SOUNDS can be LOUD, SOFT, and SHRILL.

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LESSON 4

"Hearing With Our Ears"
"Taking Care of Our Ears"

(Textbook supplement - 31 -- 37)

MAIN IDEAS:

- People hear with their ears.
- Sound travels through the air.
- Ears require proper care and protection.
- Loud sounds can hurt ears.

OBJECTIVES:

— To identify the ears as parts of the body that senses sound.
— To state that sound travels through the air.
— To describe how to care for and protect the ears.
— To identify objects that make loud sounds.

KEY WORDS:

SOUND
AIR
MAGNIFIES
LOUD SOUNDS
VIBRATIONS
OUTER EAR
STETHOSCOPE
NOISE POLLUTION
TUNING FORK
INNER EAR
INCREASES SOUND
ANIMALS
EARS
EAR DRUM
Q-TIP
SENSITIVE
SOUND WAVES
HEARING AIDS
TESTED
PROTECTION

REVIEW:

1. Something has to move to cause a SOUND (VIBRATIONS).
2. A VIBRATING TUNING FORK moves the AIR.
3. We hear SOUNDS with our EARS.
4. Everything we hear is a SOUND.
5. SOUND WAVES travel through the AIR.

MAIN POINTS:

1. The OUTER EAR is what we can see on the side of our head.
2. The OUTER EAR catches the SOUND WAVES that pass through the AIR.
3. By "cupping" your hand on your EARS you can hear SOUNDS LOUDER.
4. The OUTER EAR doesn't do any of the hearing.
5. Hearing is done inside your head in your INNER EAR.
6. When the AIR VIBRATIONS strike the EAR DRUM, the pieces in the INNER EAR move and that makes the SOUND we hear.
7. A damaged EAR DRUM will harm your ability to hear.
8. HEARING AIDS make the SOUNDS LOUDER (MAGNIFIES).
9. A doctor uses a STETHOSCOPE to MAGNIFY the SOUND of your heart.
10. A telephone INCREASES SOUND.
11. Always keep your EARS clean.
12. Never put anything into your EARS that can injure the EAR DRUM.
13. Clean your EARS with a "Q-TIP" or the end of a wash cloth.
14. Have your hearing TESTED every year.
15. Today, there are so many LOUD SOUNDS that we live with that can harm our hearing.
16. In the next few years, we will have lots of hearing problems because of NOISE POLLUTION.
17. Some ANIMALS have very SENSITIVE hearing (for PROTECTION).

LESSON 5

"Many Kinds of Food"
"Balanced Meals"
"Good Health Habits"

(Textbook supplement - 40 -- 47)

MAIN IDEAS:

- People eat many different kinds of food.
- People have preferences for particular kinds of food.
- A balanced diet is necessary to maintain a healthy body.

OBJECTIVES:

— To observe and identify pictures of different kinds of food.
— To describe their favorite food.
— To state that people need many different kinds of food to stay healthy.

KEY WORDS:

PROPERTIES
SOUND
LOUD
SOFT
HIGH
LOW
AIR
SOUND WAVES
STETHOSCOPE
TUBE MAGNIFIES
HEARING AID
FOOD
HAM
PIGS
PEANUTS
BREAD
BUNS
GRAIN
WHEAT
BANANAS
SQUID
SEAWEED
BALANCED DIET
HUNGRY
BODY
MATERIALS
GROW
REPAIR
REPLACE
VITAMINS
MINERALS
PROTEIN
CARBOHYDRATES
4 GROUPS
MEAT
FRUIT
VEGETABLES
GRAIN
CEREAL
MILK
SYSTEM
HYGENE
CHEESE
ENERGY
SANDWICH
CASSEROLES
SNACK FOODS
SWEET
SALTY
SUGAR
HYPER
DECAYS
TEETH
CLEANLINESS
SPRAYS
DIRT

REVIEW:

1. The PROPERTIES of SOUND are: LOUD, SOFT, HIGH and LOW SOUNDS.
2. SOUND WAVES travel through the AIR.
3. A paper TUBE MAGNIFIES the SOUND WAVES in the AIR.
4. "Cupping" your hand to your EARS will also MAGNIFY the SOUNDS.
5. SOUNDS need to be LOUD when a doctor uses a STETHOSCOPE to hear the beat of your heart.
6. A HEARING AID also MAGNIFIES the SOUNDS of a person who is "hard of hearing".

MAIN POINTS: (NEW CHAPTER)

1. Our FOOD comes to us from all over the world.
2. HAM comes from PIGS raised here in the Midwest.
3. PEANUTS come from the southern part of our country.
4. BREAD and BUNS come from GRAIN (WHEAT) grown in our western states.
5. BANANAS come from very warm climates (Central and South America).

6. SQUID is an "unusual food" to us; but to people in Japan, SQUID and SEA WEED is a "common food".
7. We have the FOODS that we like and other countries have the FOODS that they like.
8. Everybody in the world doesn't eat the same kind of FOODS.
9. People all need to eat FOOD.
10. It's necessary that we eat different kinds of FOODS. (BALANCED DIET).
11. When you get HUNGRY, your BODY is sending you a "signal" that it needs FOOD.
12. We need to eat so that we have MATERIALS that help us GROW and REPAIR our BODY.
13. Parts of our BODY need to be REPAIRED and REPLACED all the time.
14. Some FOODS have certain VITAMINS and MINERALS, PROTEIN, and CARBOHYDRATES.
15. All FOODS can be put into 4 GROUPS: MEAT, FRUIT AND VEGETABLES, GRAIN and CEREAL, MILK and CHEESE.
16. We need to eat FOODS from each GROUP every day.
17. BREAD and CEREAL GROUP FOODS give us ENERGY.
18. FOODS in the other GROUPS are used mainly for GROWING and REPAIR.
19. A SANDWICH may contain FOODS from each of the 4 GROUPS.
20. Sometimes a CASSEROLE will contain FOODS from each of the 4 GROUPS.
21. Most SNACK FOODS are either SWEET or SALTY.
22. SUGAR makes you HYPER and DECAYS your TEETH.
23. Too much SALT in your SYSTEM can also be bad.
24. HYGENE of FOOD (CLEANLINESS).
25. Wash most FRUITS and VEGETABLES with a very mild soap like you use to do your dishes with. (Gets off SPRAYS and DIRT).

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LESSON 6

"Teeth"
"Growing and Changing"

(Textbook supplement - 48 -- 61)

MAIN IDEAS:

- Teeth aid digestion by cutting, tearing, and grinding food.
- Living things change as they grow.

OBJECTIVES:

-- To describe how food is broken down in the mouth.
-- To describe proper care of the teeth.
-- To describe changes that occur in humans as they grow.
-- To describe changes in other living things that occur as they grow.

KEY WORDS:

FOOD
PEANUT BUTTER
BODY
CARBOHYDRATES
MEATS
SNACK FOODS
CARROTS
BREAD
SQUID
MATERIAL
4 FOOD GROUPS
MILK
SWEET
SPRAYS
GRAIN
POTATO
VITAMINS
FRUIT
CHEESE
SUGAR
DIRT
WHEAT
GROW
MINERALS
VEGETABLES
CASSEROLES
SALTY
CHEW
BANANAS
REPAIR
PROTEIN
CEREAL
SANDWICHES
APPLES
TEETH

KEY WORDS CONTINUED:

INCISOR TEETH
PREMOLARS
HAPPY
GREEN LEAFY VEGETABLES
MOUTH
MOLARS
HEALTHY
THIN
DENTIST
PLANTS
SHARP
MILK
GROWTH
CANINE TEETH
CALCIUM

REVIEW:

1. Our FOOD comes to us from all over the world.
2. BREAD comes from GRAIN (WHEAT) grown in the west.
3. BANANAS come from warm climates like South America.
4. PEANUT BUTTER comes from the south.
5. SQUID is a most unusual FOOD to be eaten here in South Bend.
6. In some parts of the world people would not eat a POTATO.
7. Everyone needs FOOD to GROW and to REPAIR our BODY.
8. It's important that we eat a variety of FOODS.
9. Each FOOD has a particular kind of MATERIAL in it. (VITAMINS, MINERALS, PROTEIN and CARBOHYDRATES).
10. All FOODS can be put into 4 FOOD GROUPS. (FRUIT and VEGETABLES, BREAD and CEREAL, MEATS, MILK and CHEESE).
11. We should eat something from each of the 4 GROUPS each day. (It's best if we can eat something from each of the 4 GROUPS at each meal).
12. Some CASSEROLES will contain FOODS from each of the 4 GROUPS.
13. Some SANDWICHES will also contain a variety of the 4 FOOD GROUPS.
14. PEANUT BUTTER is actually a VEGETABLE, but it also contains a lot of PROTEIN. (Sometimes it is used as a substitute in the MEAT GROUP.)
15. SNACK FOODS are either SWEET (lots of SUGAR) or too SALTY.
16. An APPLE and CARROTS make "super snacks" (along with CHEESE)
17. Before we eat we should wash the FRUITS and VEGETABLES with a mild soap to get rid of the SPRAYS and DIRT.

MAIN POINTS:

1. It's very important to CHEW your FOOD. (The longer you CHEW the better it is for you)
2. TEETH are used to help CHEW our FOOD.
3. INSCISOR TEETH are 4 on the top and 4 on the bottom of your MOUTH.
4. INSCISOR TEETH are very THIN and SHARP. (They cut up the FOOD into little pieces).
5. Next are the CANINE TEETH ("dog teeth") and are used for "tearing up" the FOOD.
6. Behind the CANINE TEETH are the PREMOLARS and MOLARS. (MOLARS "grind" up the FOOD).
7. It's important to take care of your TEETH. (Go to the DENTIST)
8. Some FOODS can help your TEETH. (FOODS like MILK, and GREEN LEAFY VEGETABLES contain CALCIUM.)
9. If we eat the right kind of FOODS, we will be HAPPY and HEALTHY and we're going to GROW.
10. You can tell that you are GROWING by clothes that don't fit anymore; old photographs that show you younger; a mark on the wall showing your GROWTH.
11. Not only do people GROW, PLANTS also GROW.
12. Some ANIMALS will GROW to a certain size and stop GROWING; but a PLANT will continue to GROW.

LESSON 7

"Making A Shadow"
"Light Sources"
"Shadows from Different Objects"

(Textbook supplement - 64 -- 73)

MAIN IDEAS:

- A shadow is produced when an object is positioned between a light source and a surface.
- Light comes from many sources.
- Shadows are formed when light is stopped by some objects.

OBJECTIVES:

-- To make shadows.
-- To identify different sources of light.
-- To differentiate between artificial and natural sources of light.
-- To identify objects that allow light to pass through an object that light does not go through.

KEY WORDS:

BODY
FOOD
CHEW
TEETH
SALAVIA
SWALLOW
DISSOLVE
MOUTH
CANINE TEETH
INSCISOR TEETH
PREMOLARS
MOLARS
32 TEETH
MILK
GREEN VEGETABLES
STRONG
CALCIUM
SNACK FOODS
JUNK FOODS
SUGAR
SALT
POTATO CHIPS
FATS
CALORIES
LIGHT SOURCE
SHADOWS
OBJECT
SURFACE
MOON
NATURAL LIGHT SOURCES
SUN
STARS
VOLCANO
LIGHTNING
MAN-MADE LIGHT SOURCES
CANDLE
FIRE
LAMP
FLASHLIGHT
SOLID OBJECT

REVIEW:

1. Before our BODY can use FOOD it must be CHEWED into pieces by our TEETH.
2. When FOOD is CHEWED, SALIVA breaks down the FOOD and makes it "slippery" so we can SWALLOW it. (SALIVA also helps to DISSOLVE the FOOD).
3. INSCISOR TEETH are 4 on the top and 4 on the bottom of your MOUTH.
4. Next are the CANINE TEETH ("dog teeth") that are used to "tear up" the FOOD.
5. The rest of our TEETH are called PREMOLARS and MOLARS. (32 TEETH all together)
6. In order to have good TEETH, we need to eat certain kinds of FOOD.
7. FOODS like MILK and GREEN VEGETABLES make our TEETH good and STRONG because they contain lots of CALCIUM.
8. SNACK FOODS (JUNK FOODS) are harmful to the TEETH because they contain lots of SUGAR and SALT.
9. POTATO CHIPS has a lot of SALT and FATS. (CALORIES)

10-10-10-10

MAIN POINTS: (NEW CHAPTER)

1. A LIGHT SOURCE can make SHADOWS with an OBJECT on a SURFACE.
2. You can make SHADOWS when an object stops the LIGHT SOURCE.
3. SHADOWS change when the object or LIGHT SOURCE is moved.
4. Night SHADOWS can be caused by the MOON. (LIGHT SOURCE)
5. Some NATURAL LIGHT SOURCES are: SUN, MOON, STARS, VOLCANO, LIGHTNING.
6. Some MAN-MADE LIGHT SOURCES are: FLASHLIGHT, CANDLE, FIRES, LAMP.
7. A SOLID OBJECT will make a dark SHADOW. (Can't let LIGHT go through it)

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LESSON 8

"Shadow Puzzles"
"Matching and Changing Position"
"Sun Shadows"

(Textbook supplement - 74 -- 82)

MAIN IDEAS:

- An object can be identified by its shadow.
- Shadows may be taller or shorter then the objects that cast them, depending upon their position relative to a light source.
- Shadows of different shapes may be cast by the same object.
- The shape and position of shadows produced by sunlight change during the day.

OBJECTIVES:

-- To identify common objects by their shadows.
-- To change the size of a shadow by moving the object that cast it.
-- To change the shape of a shadow by changing the orientation of the object that cast it.
-- To infer the sun's position from an object and its shadow.
-- To describe how shadows made by sunlight change through one day.

KEY WORDS:

SHADOW LIGHT SOURCE OBJECT SURFACE BACKGROUND
NATURE NATURAL SUN MOON STARS LIGHTNING
FIRE VOLCANO BIGGER SMALLER SHORT
LONG EAST

REVIEW:

1. In order to make a SHADOW we need to have a LIGHT SOURCE, and OBJECT, and a SURFACE (BACKGROUND).
2. A SHADOW moves when the LIGHT SOURCE is moved, or when the OBJECT is moved.
3. Two kinds of LIGHT SOURCES are those that man makes, and those that are found in NATURE (NATURAL-- SUN, MOON, STARS, LIGHTNING, FIRE and VOLCANOS).
4. In order to be a SHADOW the light should not be able to go through the OBJECT.

3. If we were to stand outdoors during the day our SHADOW would be in different places. (SUN moves)
4. If we were facing EAST in the MORNING our SHADOW would be behind us.
5. At NOON our SHADOW would be below us because the SUN would be overhead.
6. In the EVENING our SHADOW would be in front of us (if facing EAST).
7. The SUN rises in the EAST and sets in the WEST.
8. A SUN DIAL helps us to tell the time by using the SUN and SHADOWS.

MAIN POINTS: (NEW CHAPTER)

1. We can name all the things in the textbook pictures that show movement.
2. Going down a SLIDE is MOVING.
3. JUMPING is MOVING.
4. ROLLING is MOVING.
5. WIND makes things MOVE.
6. SAILING is MOVING.
7. WALKING is MOVING.
8. BOUNCING is MOVING.
9. FLOATING is MOVING.
10. SWIMMING is MOVING.
11. FALLING is MOVING.
12. CRAWLING is MOVING.
13. A SUNFLOWER MOVES when it GROWS.
14. MAGNETS cause things to MOVE (they ATTRACT one another.)
15. FIRING a gun makes things MOVE.
16. REFERENCE POINTS are things that don't move.
17. You OBSERVE things in RELATION (how they COMPARE) to the REFERENCE POINTS.
18. When you OBSERVE you look at things real close.

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LESSON 10

"Things Move In Different Ways"
"Things Move At Different Speeds"

(Textbook supplement - 93--101)

MAIN IDEAS:

- Objects can move in different paths.
- The way things seem to move depends on the observer's location.
- Objects move at different speeds.
- Relative motion of an object is determined by the use of reference objects.

OBJECTIVES:

-- To describe the different paths in which objects move.
-- To describe the way an object appears to be moving from a given location.
-- To identify objects that move fast and ones that move slow.
-- To describe the relative motion of objects.

KEY WORDS:

LIVE	MOVE	NON-LIVING	OBJECT	FLY
WALK	JUMP	ROLL	FLOAT	SWIM
SAIL	SLIDE	BOUNCE	FALL	PROPELLED
GROWING	SUNLIGHT	OBSERVE	MOVE	RELATION
DIRECTION	PATH	CIRCLE PATH	ARC PATH	STRAIGHT PATH
OVAL PATH	ZIG-ZAG PATH	DESCRIBE	DETERMINE	REFERENCE POINT

REVIEW:

1. Some LIVE things MOVE.
2. Some NON-LIVING things can MOVE.
3. An OBJECT can MOVE many ways.
4. Some things can FLY, WALK, JUMP, ROLL, FLOAT, SWIM, SAIL, SLIDE, BOUNCE, FALL and be PROPELLED.
5. GROWING things can move (leaves move to get the SUNLIGHT, etc.)
6. You can OBSERVE things MOVE in RELATION to a REFERENCE POINT.

MAIN POINTS:

1. The DIRECTION that all things MOVE is called a PATH.
2. STRAIGHT PATH (escalator up and down).
3. CIRCLE PATH (merry-go-round, table saw, mixer, toy train, clothes dryer, clothes washer, hands on a clock).
4. ARC PATH (when a ball is thrown into the air, or a bullet is fired).
5. OVAL PATH (horse, car and runner race track).
6. ZIG-ZAG PATH (football player, popping corn).
7. Learn to DESCRIBE exactly how the OBJECT is MOVING.
8. Learn to DETERMINE how fast the OBJECT is MOVING (past a REFERENCE POINT).

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LESSON 11

"Light From The Sun"
"Turning Night Into Day"

(Textbook supplement - 105 -- 113)

MAIN IDEAS:

- Each day the earth receives heat and light from the sun.
- Each night it gets dark outside.
- The sun is always shining.
- Day and night are caused by the rotation of the earth.

OBJECTIVES:

- To state that the earth receives heat and light from the sun.
- To state that it gets dark outside each night.
- To state that the sun is always shinging.
- To demonstrate that day and night occur because the earth turns.

KEY WORDS:

OBJECTS
CIRCLE PATH
DESCRIBE
SLOWLY
WHEELS
STARS
EARTH
MOVE
CURVED PATH
SPEEDS
SNAILS
NIGHT
MOON
GLOBE
PATH
ZIG ZAG PATH
REFERENCE POINT
RABBIT
DAY
SUN
MODEL
STRAIGHT PATH
RELATIONSHIP
TURTLES
FAST
LIGHT
HEAT
OVAL PATH
OBSERVER
MOVE
PROPELLER
DARK
YEAR

REVIEW:

1. OBJECTS MOVE along a certain type of PATH.
2. CIRCLE PATH, (hands on a clock, merry-go-round, propellers on helicopter, blender, clothes dryer, circular saw, mixer).
3. STRAIGHT PATH (Elevator, escalator, automobile).
4. OVAL PATH (horse race track, car race track, sports race track).
5. CURVED PATH (windshield wiper, a thrown ball).
6. ZIG-ZAG PATH (football player, some video game characters, ball on pool table).
7. Things move in RELATIONSHIP to the OBSERVER.
8. Learn to DESCRIBE exactly how the OBJECT is MOVING.
9. MOVING things MOVE with different SPEEDS.
10. Learn to DETERMINE how fast OBJECTS MOVE by using a REFERENCE POINT.
11. TURTLES are SLOW MOVING things.
12. Hour hand on a clock MOVE SLOWLY.
13. SNAILS move SLOWLY.
14. RABBIT moves FAST.
15. PROPELLER on an airplane move FAST.
16. WHEELS on an automobile move FAST.

MAIN POINTS: (NEW CHAPTER)

1. NIGHT and DAY are different.
2. It's LIGHT during the DAY and DARK during the NIGHT.
3. During the DAY you can see the SUN, but at NIGHT you can see the STARS and MOON.
4. In the SUMMERTIME, the TEMPERATURE is COOLER during the NIGHT......and WARMER during the DAY (the SUN gives us HEAT).
5. The SUN gives us LIGHT.
6. Certain times during the YEAR our DAYS and NIGHTS have different lengths.
7. We live by the SUN (get up when the SUN rises; go to bed when the SUN has set.)
8. The SUN stays in the same place and the EARTH is MOVING.
9. The SUN is always shining.
10. A GLOBE is just a MODEL of the EARTH.

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15-15-15-15

LESSON 12

"The Earth Turns Once In A Day"

(Textbook supplement - 114 -- 123)

MAIN IDEAS:

- The earth rotates once in 24 hours.
- It is not possible to feel the earth turn.
- It is not easy to see the roundness of the earth from its surface.
- The apparent movement of the moon across the sky is mostly caused by the rotation of the earth.
- As the moon moves around the earth, its shape seems to change.

OBJECTIVES:

-- To state that it takes 24 hours for the earth to make one complete turn.
-- To explain why it is not possible to feel the earth turn.
-- To explain why it is not easy to see the roundness of the earth from its surface.
-- To state that the apparent motion of the moon across the sky is caused by the rotation of the earth.
-- To demonstrate that the apparent change of the moon's shape is caused by the relative movements of the moon, earth and sun.

KEY WORDS:

DAY
STARS
POSITIONED
SPINS
WORLD
SURFACE
NIGHT
MOON
HEAT
ROTATES
MOVEMENT
ROUND
CALENDAR DAY
WARMER
MORNING
SPARE
SURFACE
HOT
YEAR
LENGTH
NOON
GLOBE
DOWN
REFLECTS LIGHT
SUN
EARTH
EARTH MOVES
MODEL
GRAVITY
LIGHT

REVIEW:

1. There is a DAY and NIGHT for every CALENDAR DAY of the YEAR.
2. During the DAY you can see the SUN, but at NIGHT you can see the STARS and MOON.
3. It's usually WARMER during the DAY then at NIGHT.
4. DAY and NIGHT aren't always the same LENGTH (the way the EARTH and the SUN are POSITIONED with one another.)
5. The SUN gives off HEAT.
6. We live by the POSITION of the SUN (get up in the MORNING, eat at NOON, sleep during the NIGHT.)
7. When the EARTH MOVES (SPINS) we call that ROTATE (ROTATION).
8. Pictures have been taken of the EARTH from SPACE.
9. A GLOBE is a MODEL of the WORLD so that we can understand it.
10. The SUN is shining all the time.

MAIN POINTS:

1. The EARTH ROTATES.
2. We don't feel the EARTH ROTATING because the EARTH is 25,000 miles around (too big to feel the MOVEMENT).

3. The SURFACE to us is always DOWN to us.
4. Everything on EARTH is always MOVING together.
5. The SUN is not MOVING (the EARTH MOVES to cause NIGHT and DAY.)
6. The EARTH moves almost 1,000 miles an hour (depending on where you are).
7. GRAVITY holds everything down on the SURFACE.
8. The EARTH is ROUND because you can take a trip and go all the way around by traveling in the same direction.
9. The center of the EARTH is very, very HOT.
10. Pictures taken of the EARTH from SPACE also show us that the EARTH is ROUND.
11. We can only see that part of the MOON that the SUN is shining on.
12. The MOON has no LIGHT (REFLECTS LIGHT from the SUN).

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LESSON 13

"Sources of Heat"
"Heat On The Move"

(Textbook supplement - 126 -- 139)

MAIN IDEAS:

- Heat is a form of energy.
- There are many different sources of heat.
- Heat may move from one place to another.
- The movement of heat can be reduced by certain kinds of materials.
- Thermometers are instruments that measure temperature.

OBJECTIVES:

-- To state that heat is a form of energy.
-- To identify and describe sources of heat.
-- To state that heat may move from one place to another.
-- To identify times when we want to keep heat from moving.
-- To identify a thermometer and describe what it is used for.

KEY WORDS:

EARTH
HOT
SKIN
ROTATES
SUN
ROCKS
ROUND
COLD
HEAT
SPACE
THERMOS
ENERGY
MOON
BURN
WARM

REVIEW:

1. The EARTH ROTATES as it "spins" around (more than 1,000 miles an hour).
2. The EARTH is ROUND (as seen from SPACE).
3. Before the SPACE ships, people knew the EARTH was ROUND because they could go all the way around.
4. We can see that the MOON stays where it is in SPACE (the EARTH turns and it looks like the MOON moves.)

MAIN POINTS: (NEW CHAPTER)

1. There are things in our homes that can get HOT.
2. The SUN is very HOT in SPACE.
3. There are things in our homes that can get COLD.
4. A THERMOS can keep things HOT and COLD.
5. When you BURN your SKIN it hurts, and it gets red.
6. ROCKS can hold lots of HEAT ENERGY.
7. HEAT ENERGY will change things (move only from a COLD place to a WARM place.)
8. Wear protective clothing or keep a distance from things HOT.
9. The outside of a THERMOS is neither WARM or COLD.
10. HEAT will move into where it's COLDER.

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LESSON 14

"Using Heat and Cold"

(Textbook supplement - 140 -- 143)

MAIN IDEAS:

- Objects can be changed when heat is added to them or taken from them.
- Changes brought about by adding heat or removing it can be either desired or undesired.

OBJECTIVES:

— To describe how heating an object or making it colder can change it.
— To identify wanted and unwanted changes brought about by adding or removing heat energy.

KEY WORDS:

HEAT ENERGY
HOT
AIR
ZERO
ACCURATE TEMPERATURE
SOLID
FOOD
HOTTEST
COLD
WARM
LABORATORY
CHANGE
POPCORN
PRESERVED
COOLER
INSULATION
ICE
FREEZE
TOAST
EXPLODES
REFRIGERATOR
THERMOMETER
MATERIAL
TEMPERATURE
BOIL
BREAD
ICE CREAM
SPOIL
THERMOS
SLOWLY
COLD
ICE CUBE
EGGS
LIQUID
TEMPERATURE

REVIEW:

1. HEAT ENERGY can burn your skin.
2. HEAT ENERGY always moves from the HOTTEST place to a COOLER PLACE.
3. A THERMOMETER can tell how HOT or COLD things are.
4. A THERMOS cup can keep things HOT or COLD and you can't tell by touching the outside which is which.

5. A spoon placed in a HOT liquid will get HOT.
6. A spoon placed in a COLD liquid will get COLD.
7. INSULATION is a MATERIAL that HEAT won't move through very fast.
8. HEAT moves SLOWLY through AIR.
9. Everything is WARM or has HEAT until it gets to the point that is has no HEAT in it.
10. ICE still has some TEMPERATURE in it (32 degrees when it forms).
11. We should really say how WARM things are instead of how COLD things are when we take a TEMPERATURE.
12. When things have no HEAT they will have to be 459 degrees below ZERO (and can only be made in a LABORATORY).
13. THERMOMETERS give us an ACCURATE TEMPERATURE of things (how much HEAT is present).
14. WATER will FREEZE at 32 degrees.
15. WATER will BOIL at 212 degrees.

MAIN POINTS:

1. An ICE CUBE will CHANGE when you add HEAT to it.
2. TOAST is BREAD that has been CHANGED by adding HEAT.
3. EGGS will CHANGE when you add HEAT (they turn to a SOLID).
4. POPCORN will CHANGE when you add HEAT (it EXPLODES).
5. ICE CREAM will CHANGE when you add HEAT (turns to a LIQUID).
6. FOOD will be PRESERVED in a REFRIGERATOR.
7. FOOD will SPOIL if it CHANGES. (Meat must be COLD and not WARM).
8. All FOODS must be kept at a proper TEMPERATURE.

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LESSON 15

"Magnets Can Pull"
"Pushing and Pulling With A Magnet"

(Textbook supplement - 146 -- 155)

MAIN IDEAS:

- Magnets will attract objects made of steel, iron, nickel, and cobalt.
- Magnets come in a variety of sizes and shapes.
- The pull of a magnet is strongest at its poles.
- Magnets can act through non-magnetic materials.
- The poles of two magnets eigher attract or repel each other.
- A strong magnet can be used to make other magnets.

OBJECTIVES:

- To identify and describe objects attracted to a magnet.
- To describe the sizes and shapes of various magnets.
- To identify the poles as the places on a magnet where its pull is the strongest.
- To list materials a magnet can pull through.
- To demonstrate that the poles of two magnets either attract ot repel each other
- To make and experiment with a permanent magnet.

KEY WORDS:

CHANGE
HEAT
COLD
FOODS
FREEZER
REFRIGERATOR
MAGNETS
METAL
IRON
STEEL
NICKEL
COBALT
HORSESHOE
MAGNET
STRONGEST
BAR MAGNET
CURRENT
SHAPES
ALUMINUM FOIL
PAPER
ATTRACT
WAX PAPER
CLOTH
WOOD
PLASTIC WRAP
MAGNETIZE
IRON FILINGS

REVIEW:

1. Some things will CHANGE when we add HEAT to them.
2. Some things will CHANGE when we add COLD to them.
3. To keep some of our FOODS from CHANGING we put them in a FREEZER or a REFRIGERATOR.

MAIN POINTS: (NEW CHAPTER)

1. Most people like to play with MAGNETS.
2, A MAGNET is a piece of METAL that will pick up other METAL things.
3. You can use a MAGNET to pick up spilled METAL things.
4. MAGNETS will pick up IRON, STEEL, NICKEL, and COBALT.
5. A HORSESHOE MAGNET is one of the strongest kind.
6. A BAR MAGNET is shaped like a long bar of METAL.
7. MAGNETS are made by putting a CURRENT into METAL.
8. MAGNETS can be in many different SHAPES.
9. Anything that has IRON, STEEL, NICKEL, or COBALT in them can be made into a MAGNET.
10. IRON FILINGS on top of ALUMINUM FOIL will be attracted by a MAGNET and stand up.
11. IRON FILINGS on top of a piece of PAPER will be attracted by a MAGNET.
12. A MAGNET will ATTRACT some IRON FILINGS through WAX PAPER.
13. A MAGNET will ATTRACT some IRON FILINGS through PLASTIC WRAP.
14. A MAGNET will ATTRACT some IRON FILINGS through a piece of CLOTH.
15. A MAGNET will not ATTRACT through a piece of WOOD or METALS that do not contain IRON.
16. You can MAGNETIZE an IRON screw driver (for a few hours) by rubbing the screw driver against a MAGNET.
17. MAGNETS will push one another away if you hold them just right.

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LESSON 16

"Find the Way With A Magnet"
"The Uses of Magnets"

(Textbook supplement - 156 -- 161)

MAIN IDEAS:

- When a magnet needle is free to turn, one end will always point north.
- A compass contains a small magnet, the needle, that is free to turn.
- Magnets have a variety of uses.

OBJECTIVES:

-- To construct a compass and demonstrate how it is used.
-- To state why a compass is important.
-- To identify and describe different ways magnets are used.

KEY WORDS:

MAGNET
IRON
CLOTH
ALUMINUM FOIL
MAGNET POLE
METAL
NICKEL
NORTH POLE
DIRECTIONS
MAGNETIC TAPES
SHAPE
COBALT
SOUTH POLE
SHIP
HORSESHOE MAGNET
WOOD
MAGNETIZES
LAND MARKS
STEEL
PLASTIC
COMPASS
EARTH

REVIEW:

1. A MAGNET is a piece of METAL that will pick up certain kinds of METAL.
2. A MAGNET can be almost any SHAPE.
3. The Horseshoe MAGNET is the most common.
4. MAGNETS will pick up STEEL, IRON, NICKEL, (and COBALT).
5. MAGNETS won't pick up WOOD, CLOTH, or PLASTIC.
6. A MAGNET has a NORTH POLE and a SOUTH POLE.
7. If you take a piece of METAL and rub it on a MAGNET it would MAGNETIZE it (for a little while).
8. MAGNETIZED screw drivers are handy.

MAIN POINTS:

1. A COMPASS is easy to make.
2. A MAGNET will not be attracted to ALUMINUM FOIL. (ALUMINUM FOIL contains no IRON).
3. A COMPASS is a tiny MAGNET.
4. COMPASSES are used by people who need to know DIRECTIONS.
5. Any ship needs a COMPASS (where you don't have any LAND MARKS.)

NOTE: IF YOU USE ALUMINUM FOIL TO MAKE YOUR "BOAT" COMPASS, DON'T USE DETERGENT IN THE WATER (THE ALUMINUM WILL SINK).

6. The EARTH has a MAGNET POLE (which ATTRACTS a MAGNET).
7. A big MAGNET will sort trash, lift heavy METAL objects such as junk cars.
8. We use MAGNETS in our homes (door fasteners, hold notes on METAL door, pin holder, screw drivers, MAGNETIC TAPES, etc.

21-21-21-21

LESSON 17

"Plants and Animals Live in Many Places"
"Night and Day in the Desert"

(Textbook supplement - 164 - 175)

MAIN IDEAS:

- Plants and animals live in many different environments on land.
- The physical characteristics of different land environments vary greatly.
- In most deserts the climate is very hot and dry and it seldom rains.
- Desert animals have special adaptations that make it possible for them to live in a desert environment.

OBJECTIVES:

-- To identify and describe various plants and animals that live on land.
-- To compare and contrast the physical characteristics of different land environments.
-- To describe the physical characteristics of deserts.
-- To identify ways in which some animals have adapted to live in a desert.

KEY WORDS:

COMPASS	MAGNET	NORTH	EARTH	MAGNETIC NORTH POLE
WARM	RAIN	TREES	JUNGLE	TROPICAL RAIN FOREST
FOOD	LIGHT	GRASSLAND	GRASS	MOUNTAINS
WATER	SWAMP	CITY PARK	FED	DESERT
COOL				

REVIEW:

1. A COMPASS (beacuse it's a MAGNET) always points NORTH (because the EARTH has a MAGNETIC NORTH POLE).
2. Sailors, Airplane pilots, Surveyors, Hunters, Campers are some of the users of a COMPASS.
3. A COMPASS can lead you in a straight line.

MAIN POINTS: (NEW CHAPTER)

1. A TROPICAL RAIN FOREST is very WARM and has lots of RAIN.
2. Most TROPICAL RAIN FORESTS have very tall TREES.
3. Snakes, spiders, monkeys, birds, toads, frogs all live in the JUNGLE.
4. Most of JUNGLE animals live in the top of TREES (to get the FOOD and LIGHT).
5. A GRASSLAND has lots of GRASS.
6. Giraffes, lions, elephants, zebras, tigers, all live in GRASSLANDS.
7. Many of the animals in GRASSLANDS eat GRASS and other animals.
8. GRASS takes less WATER to grow than TREES.
9. GRASSLANDS are very WARM.
10. Raccoons, rabbits, gophers, mice, sheep, goats, bears, deer can live In the MOUNTAINS.

11. Geese, ducks, snakes, turtles, alligators, lily pads, all live in a SWAMP.
12. In a CITY PARK the plants and animals are FED by people.
13. Rattlesnakes, prairie dogs, foxes, all live in the DESERT.
14. DESERT animals come out at night when it's COOL.

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LESSON 18

"More Desert Animals"
"Desert Plants"

(Textbook supplement - 176 -- 180)

MAIN IDEAS:

- Many different kinds of animals live in the desert.
- Desert plants have special adaptations which make it possible for them to live in a desert environment.

OBJECTIVES:

-- To identify several kinds of desert animals.
-- To identify ways in which some plants have adapted to life in the desert.

KEY WORDS:

ENVIRONMENT
TROPICAL RAIN FOREST
MONKEYS
PRAIRIE DOGS
COLD
RABBITS
PARK
VERY COLD
PROTECTION
STINGER
POISON
LEAVES
PLANTS
JUNGLE
FOOD
DEER
GOATS
SWAMP AREAS
TAME
NIGHT
CACTUS
TAIL
HORN TOAD
NEEDLES
ANIMALS
SNAKES
PEOPLE
GIRAFFES
SHEEP
SNAKES
PEOPLE
COOLER
PLANTS
TARANTULA
POISONOUS
WATER
SOIL
SPIDERS
LIONS
WARM
BIRDS
FISH
DESERT
DESERT BIRDS
NEEDLES
SPIDER
LIZARDS
WEATHER
BIRDS
GRASSLANDS
DRY
MOUNTAIN ENVIRONMENTS
ALLIGATORS
VERY HOT
DESERT ANIMALS
SCORPION
SIDEWINDER SNAKE
SHAMROCK PLANT

REVIEW:

1. ENVIRONMENT is the place where PLANTS, ANIMALS, SOIL, and WEATHER all are together.
2. There are different kinds of ENVIRONMENTS.
3. The TROPICAL RAIN FOREST (JUNGLE) is a place where SNAKES, SPIDERS, BIRDS, and MONKEYS live.
4. Most of the ANIMALS live in the upper part of the RAIN FOREST because the LIGHT and FOOD is up there.
5. A TROPICAL RAIN FOREST is not a good place for PEOPLE to live.
6. GRASSLANDS is a place where LIONS, DEER, PRAIRIE DOGS, GIRAFFES can live.
7. GIRAFFES and PRAIRIE DOGS eat the PLANTS; the LIONS eat the ANIMALS that eat the GRASSES.
8. GRASSLANDS are WARM but trees do not grow because it's too DRY.

9. MOUNTAIN ENVIRONMENTS are usually COLD.
10. MOUNTAINS is a place where GOATS, SHEEP, BIRDS, DEER and little ANIMALS like RABBITS, and PRAIRIE DOGS can live.
11. SWAMP AREAS is a place where SNAKES, FISH, ALLIGATORS can live.
12. In a PARK the PLANTS and ANIMALS are TAME and taken care of by PEOPLE.
13. DESERT is a place that is very extreme (VERY HOT and VERY COLD).
14. DESERT ANIMALS come out at NIGHT when it's COOLER.

MAIN POINTS:

1. Many DESERT BIRDS find PROTECTION in the CACTUS PLANTS.
2. NEEDLES on a CACTUS PLANT is PROTECTION from BIRDS and ANIMALS.
3. The SCORPION is a very interesting little ANIMAL that lives in the DESERT.
4. SCORPIONS usually live under rocks; their STINGER is in their TAIL.
5. The TARANTULA is the biggest SPIDER you will find in the DESERT.
6. Normally, the TARANTULA won't bite (unless teased).
7. The SIDEWINDER SNAKE has lots of POISON but wouldn't kill you (unless you are sick).
8. The HORN TOAD are not POISONOUS and like to eat ants.
9. The HORN TOAD are LIZARDS.
10. A SHAMROCK PLANT is a good plant to grown in a classroom.
11. The CACTUS doesn't have any LEAVES (has NEEDLES instead).
12. The CACTUS stores WATER for long periods of time.

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LESSON 19

"Living In The Cool, Dark, Moist Woods"
"Plants And Animals In The Woods"

(Textbook supplement - 181 -- 189)

MAIN IDEAS:

- The forest environment is relatively cool, dark, and moist.
- Many different kinds of plants and animals live in the woods.

OBJECTIVES:

-- To describe the physical characteristics of the forest.
-- To identify several different kinds of plants and animals that live in the woods.

KEY WORDS:

DESERT
RATTLESNAKES
CACTUS PLANT
BIRDS
BENDIX PARK
DECIDUOUS
WINTER
COLD WIND
TERMITES
WOODS
DECOMPOSING MATERIALS
SCORPIONS
REPTILES
NEEDLES
CACTUS STEMS
WOODLAND
LEAVES
COOLER
DECOMPOSING
FUNGI
EARTHWORMS
TARANTULAS
COLD BLOODED
PROTECT
ANIMALS
ST. PATRICKS PARK
FALL
SHADE TREES
MINERALS
ROCKS
BEETLES
LIZARDS
TEMPERATURE
WATER
ENVIRONMENT
EVERGREEN TREES
SPRING
AIR
BUGS
ACID
SLUGS
HORN TOADS
WARM
PLANTS
COUNTY PARKS
BROADLEAF
SUMMER
TREES
WORMS
RAIN
SNAILS

REVIEW:

1. Some of the ANIMALS that live in the DESERT are SCORPIONS, TARANTULAS, LIZARDS, HORN TOADS, AND RATTLESNAKES (REPTILES).
2. REPTILES are COLD BLOODED and move about only when the TEMPERATURE is very WARM.
3. Some BIRDS that live around South Bend sing in the morning.
4. A CACTUS PLANT has NEEDLES to PROTECT the plant.
5. WATER is collected in the CACTUS STEMS (NEEDLES PROTECT the PLANT from ANIMALS).

MAIN POINTS:

1. An ENVIRONMENT is a place where PLANTS and ANIMALS live.
2. A WOODLAND ENVIRONMENT is where we live.
3. Any of our COUNTY PARKS are nice WOODLAND ENVIRONMENTS (BENDIX PARK, ST. PATRICK'S PARK).
4. Two main types of TREES are in the WOODLANDS.
5. EVERGREEN TREES have NEEDLES all year long.
6. BROADLEAF (DECIDUOUS) lose their LEAVES in the FALL.
7. A WOODLAND FOREST looks different during SPRING and FALL as well as during WINTER and SUMMER.
8. When you go into the WOODS you can feel a TEMPERATURE change (COOLER).
9. SHADE TREES COOL the AIR around them.
10. In the WINTERTIME the TREES break the COLD WIND. (EVERGREENS)
11. Decomposing is when PLANTS and ANIMALS die and break-up.
12. PLANTS and ANIMALS have many MINERALS.
13. BUGS and WORMS help to DECOMPOSE dead things.
14. TERMITES help to DECOMPOSE dead trees.
15. FUNGI are a PLANT that grows on DECOMPOSING MATERIALS.
16. Over hundreds of thousands of years ROCKS will DECOMPOSE.
17. The ACID in our RAIN will help to DECOMPOSE ROCKS faster.
18. Some ANIMALS that live in the WOODS are EARTHWORMS, BEETLES, SLUGS, SNAILS.
19. Whenever you look for things in the WOODS, be sure to put things back the way you found them.

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LESSON 20

"Living On Land and In The Water"
"Insects Live Near Ponds"

(Textbook supplement 192-- 204)

MAIN IDEAS:

- Many Different kinds of animals live in or near a freshwater pond.
- Animals that live in or near freshwater ponds are adapted to their environments.
- Many insects live near ponds.
- Water birds are adapted to live in their environment.

25-25-25-25

OBJECTIVES:

-- To identify some plants and animals that live in or near a freshwater pond.
-- To discuss how protective coloration helps an animal to live in its environment.
-- To describe ways in which some freshwater pond animals are suited to their environment.
-- To identify basic insect characteristics.
-- To describe how some water birds are well suited to their environment.

KEY WORDS:

WOODS	TREES	EVERGREEN	BROADLEAF	NEEDLES
LEAVES	YEAR	SPRING	FLOWERS	FLOOR
FALL	DIE	DECOMPOSE	PLANTS	ANIMALS
SMELL	INSECTS	DEAD	WATER	AIR
MUSHROOMS	ROCKS	BACTERIA	FUNGI	SAND
PARTICLES	FREEZE	MICROSCOPIC PLANTS	SNAKES	LIZARDS
TURTLES	SALAMANDERS	FROGS	BIRDS	SEA GULLS
DUCKS	PONDS	LILY PAD	ROOTS	ANCHOR
STEMS	SOIL	TELEPHONE POLE	GRASSES	FOOD
FLIES	INSECTS	FISH	BERRIES	BREAD
GRAIN	BLUE HERRON	MUSKRAT	SHORE	TOADS
OTTERS	SHELLFISH	MOOSE	TADPOLES	WORLD
MICROSCOPE	EGGS	6 LEGS	3 BODY PARTS	SPIDERS
8 LEGS	2 BODY PARTS	HOURS	YEARS	BIRDS
BILLS	SCOOP	SPEAR	CLAW	TEAR
FEET	SWIM	PADDLE	RUN	HOP

REVIEW:

1. WOODS around here have two kinds of TREES (EVERGREENS and BROADLEAF).
2. All the TREES that have NEEDLES are not alike.
3. All the TREES that have LEAVES are not alike.
4. The WOODS does not look the same all YEAR around.
5. In the SPRING there are lots of FLOWERS growing on the FLOOR of the WOODS.
6. By FALL the LEAVES leave the trees.
7. When things DIE they DECOMPOSE (both PLANTS and ANIMALS).
8. Things have a SMELL when they DECOMPOSE.
9. The INSECTS might eat holes through DEAD things letting in WATER, AIR and MICROSCOPIC PLANTS (BACTERIA).
10. FUNGI also grows on DECOMPOSING things (MUSHROOMS).
11. All of the DECOMPOSED things are re-used by PLANTS and ANIMALS.
12. ROCKS even break-down and DECOMPOSE (Over a long period of time).
13. SAND is tiny PARTICLES of big ROCKS.
14. When WATER gets into holes it will FREEZE and break ROCKS apart.

MAIN POINTS:

1. Some PLANTS and ANIMALS that live in and around WATER are: SNAKES, LIZARDS, TURTLES, SALAMANDERS, FROGS, BIRDS, (SEA GULLS) and DUCKS.
2. A PLANT that is most common around PONDS is a LILY PAD.
3. LILY PADS grow in shallow water and have roots that ANCHOR them to the bottom of the POND.

4. Some LILY PADS have STEMS that go down into the SOIL that are bigger than TELEPHONE POLES.
5. Everytime you break a LILY PAD STEM it will grow a new PLANT.
6. The TURTLE gets FOOD by eating FLIES, INSECTS, FISH, BERRIES, ROOTS.
7. DUCKS eat GRASSES, FISH, BREAD and GRAIN.
8. BLUE HERRON'S eat FISH.
9. MUSKRAT likes to eat ROOTS along the SHORE.
10. SNAKES like to eat INSECTS, FROGS, TOADS, and small ANIMALS.
11. OTTERS eat SHELLFISH, and FISH.
12. MOOSE eat PLANTS along the shallow bottom.
13. There are more INSECTS in the WORLD than all other ANIMALS put together. (more kinds).
14. INSECTS eat nearly everything.
15. INSECTS also eat one another, small FISH and TADPOLES.
16. Some INSECTS are so small that you need a MICROSCOPE to see them.
17. All INSECTS lay EGGS.
18. All INSECTS have 6 LEGS and 3 BODY PARTS.
19. SPIDERS are closely related but have 8 LEGS and 2 BODY PARTS.
20. Some INSECTS will live only for a few HOURS; while others will live for many YEARS.
21. INSECTS don't always look the same throughout their lifetime.
22. BIRDS' BILLS usually tell things about them.
23. Some BILLS can SCOOP, SPEAR, CLAW, and TEAR things.
24. Some BIRDS have FEET that can SWIM, PADDLE, RUN and HOP.

LESSON 21

"Beavers and Other Pond Animals"
"Making A Pond"

(Textbook supplement - 205 -- 209)

MAIN IDEAS:

- Beavers are adapted to live in their water environment.
- There are other mammals that live near fresh water.
- An aquarium can be used as a model for a pond environment.

OBJECTIVES:

-- To discuss how beavers are well suited to their environment.
-- To name other mammals that live near fresh water.
-- To assist in the construction of an aquarium.
-- To observe and describe the animals in the aquarium.

KEY WORDS:

LILY PAD
ANIMALS
SALAMANDER
LARGE
JUMPING
YEAR
BILLS
WATER
LODGE
QUART JAR
DISEASE

STEMS
FOOD
DUCK
FLYING
CRAWLING
HOURS
FEET
TAIL
WARM
GALLON JAR
SALMONELLA

ROOTS
TURTLE
INSECTS
RUNNING
3 BODY PARTS
MAGGOTS
DAM
SWIM
DRY
PLANT
FLU

SHALLOW LAKE
SNAKES
BLUE HERRON
SWIMMING
6 LEGS
FLIES
BEAVER
LONG TEETH
FAMILIES
SNAILS

POND
FISH
SMALL
RIDING
LAY EGGS
BIRDS
GROW
FUN
AQUARIUM
HALF-GALLON JAR

REVIEW:

1. LILY PADS have STEMS and ROOTS that ANCHOR themselves to the bottom of a SHALLOW LAKE or POND.
2. Some of the ANIMALS that live in a LAKE or POND get their FOOD by swimming, after their FOOD (TURTLES), SNAKES, SALAMANDERS, FISH and DUCKS.)
3. The BLUE HERRON wades around the water for its FOOD.
4. Some INSECTS are very SMALL while some are very LARGE.
5. Some INSECTS get around by FLYING, RUNNING, SWIMMING, RIDING on ANIMALS,
6. ALL INSECTS have 3 BODY PARTS, 6 LEGS and they all LAY EGGS.
7. Some INSECTS may live for YEARS, while others live for only a few HOURS.
8. MAGGOTS turn into FLIES.
9. The BIRDS have different kinds of BILLS and FEET.

MAIN POINTS:

1. The BEAVER'S front TEETH continue to GROW all the time.
2. The BEAVER gnaws on wood to keep the LONG TEETH shortened and sharpened.
3. The BEAVER lives around the WATER and uses the TAIL to help SWIM.
4. BEAVERS build DAMS (LODGE) for their home.
5. BEAVERS were killed for their FUR.
6. The entrance to their LODGE is under the WATER and the home is WARM and DRY.
7. BEAVERS live in FAMILIES.
8. A simple AQUARIUM can be made by using a QUART JAR or HALF-GALLON or GALLON JAR.
9. An AQUARIUM needs to have PLANTS from the POND along with SNAILS.
10. Many TURTLES carry a DISEASE called SALMONELLA.
11. SALMONELLA is like having the FLU for a long, long time.

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LESSON 22

"The Salty Ocean"
"Plants and Animals of the Ocean"
"Sea Animals Eat Plants and Other Animals"

(Textbook supplement - 210 -- 221)

MAIN IDEAS:

- All the oceans of the world really make up one big ocean.
- Ocean water is salty.
- Many different kinds of animals live in the ocean.
- Animals in the ocean eat plants or other animals.

OBJECTIVES:

-- To state that all the oceans of the world are really all one big ocean.
-- To investigate what happens to salty water when it is evaporated.
-- To identify and describe some plants and animals that live in the ocean.
-- To explain that ocean animals eat plants or other animals.

KEY WORDS:

BEAVER
LODGE
TREES
DRY
PLANTS
ALGAE
OCEAN
EARTH
STARFISH
TAIL
DAM
TEETH
WARM
AQUARIUM
SUNLIGHT
SALTY
CONNECTED
PIRANHA
SWIMMING
BEAVER HOME
FAMILY
WINTERTIME
WATER
AQUARIUM PLANTS
SUN EVAPORATES
SHIPS
RIVERS
CLAWS
FUR COAT
POND
ANIMALS
AIR
OXYGEN
SALT MINERALS
PLANTS
WHALES
FOOD
COLD WATER
LAKE
BIRDS
SNAILS
EVAPORATING
WATER SURFACE
SHELLS
SOUTH AMERICA

REVIEW:

1. The BEAVER does many useful things for man.
2. The BEAVER has a broad TAIL that is used for SWIMMING.
3. The BEAVER'S CLAWS can hold on to things and digs for FOOD.
4. A BEAVER HOME is called a LODGE (next to a DAM).
5. The BEAVER has a heavy FUR COAT that protects him from the COLD WATER.
6. The BEAVER cuts down TREES with ever growing TEETH.
7. BEAVERS live in a FAMILY.
8. BEAVERS live on a POND or a LAKE.
9. BEAVER DAMS are built very sturdy.
10. The LODGE is very DRY inside and stays nice and WARM during the WINTERTIME.
11. The PONDS that are formed behind a BEAVER DAM become homes for other ANIMALS, BIRDS, and PLANTS.
12. You can make an AQUARIUM out of anything that will hold WATER.
13. If you have a small AQUARIUM don't put so many things in it.
14. Have a wide opening at the top for AIR to get in.
15. SNAILS eat AQUARIUM PLANTS and ALGAE.
16. Never place an AQUARIUM in the bright SUNLIGHT. (WATER gets too WARM and that cuts down the amount of OXYGEN the WATER can hold.)

MAIN POINTS: (NEW CHAPTER)

1. The WATER is EVAPORATING from the OCEAN all of the time.
2. All of the things that have been carried into the OCEAN is left there.
3. The OCEAN WATER is SALTY because the SUN EVAPORATES the WATER and leaves the SALT MINERALS behind.
4. There's more WATER SURFACE on the EARTH than there's LAND.
5. All of the OCEANS are CONNECTED with one another.
6. The OCEAN is SALTY and PONDS and LAKES are not SALTY.
7. Big SHIPS sail on the OCEANS.
8. Many kinds of PLANTS and ANIMALS live in the OCEANS.
9. ANIMALS that have SHELLS live in the OCEANS.
10. STARFISH are bright-colored when they are alive, gray or brown when we see them dead.
11. Many of the PLANTS and ANIMALS are bright-colored in the OCEAN.
12. PIRANHA are FISH that live in the RIVERS of SOUTH AMERICA and not in the OCEAN.
13. In the OCEAN we have ANIMALS that might be 100 feet long; and some that are so little you can't even see them.
14. WHALES eat lots of these tiny ANIMALS and it would take many to fill up a WHALE.

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LESSON 23

"Dinosaurs"
"Many Kinds of Dinosaurs"

(Textbook supplement - 224 -- 231)

MAIN IDEAS:

- Dinosaurs were animals that lived long ago.
- Scientists use fossils to study animals of the past.
- There was much variation among the dinosaurs.

OBJECTIVES:

-- To observe and describe a picture of a dinosaur and its environment.
-- To explain how fossils help people learn about the past.
-- To compare and contrast physical characteristics of various dinosaurs.

KEY WORDS:

OCEANS
PROTECTION
STARFISH
PLANKTON
INDIA INK
CLAMS
DINOSAURS
CRINOID
MOUSE
DINOSAUR TEETH

CONNECTED
CLAMS
OCEAN ANIMALS
OCTOPUS
PLANTS
SNAILS
FOSSIL
EARTH
REPTILES

SALT WATER
SHRIMP
POISONOUS SPINES
SQUID
FISH
CANDIES
MINERALS
FLESH
DINOSAUR BONES

ANIMALS
LOBSTERS
WHALE
CLOUD
OYSTERS
ALGIN
STONE
TURKEYS
MUSEUMS

SHELLS
SHELLFISH
MICROSCOPE
ENEMIES
SCALLOPS
SEAWEED
INDIAN BEADS
RATS
SKIN

REVIEW:

1. All of the OCEANS are all CONNECTED with one another.
2. OCEANS are made-up of SALT WATER.
3. A lot of ANIMALS that live in the OCEAN has SHELLS for PROTECTION. (CLAMS, SHRIMP, LOBSTERS, SHELL FISH, STARFISH).
4. Some OCEAN ANIMALS have POISONOUS SPINES they use for PROTECTION.
5. The WHALE is one of the biggest ANIMALS in the OCEAN (from 60 to 100 feet long).
6. PLANKTON are some of the smallest ANIMALS in the OCEAN (seen with a MICROSCOPE).
7. WHALES eat lots of PLANKTON.
8. A lot of OCEAN ANIMALS are bright-colored.
9. An OCTOPUS is a funny-looking ANIMAL.
10. A SQUID sends out a black CLOUD into the water to hide from ENEMIES.
11. INDIA INK is made from the SQUID.
12. All of the ANIMALS that live in the OCEAN eat one another or PLANTS.
13. People eat lots of OCEAN ANIMALS (FISH, LOBSTERS, OYSTERS, SHRIMP, SCALLOPS, CLAMS, OCTOPUS, SQUID, SNAILS.)
14. Most CANDIES have something that comes from the OCEAN (ALGIN: SEAWEED).

MAIN POINTS: (NEW CHAPTER)

1. There aren't any living DINOSAURS in the world today.
2. A FOSSIL is formed when an ANIMAL dies and the MINERALS replace it in the STONE (not really the ANIMAL itself.)
3. We can find FOSSILS of both PLANTS and ANIMALS.
4. INDIAN BEADS are really FOSSILS (the stem of a little ANIMAL called the CRINOID).
5. The CRINOIDS lived before the DINOSAURS.
6. DINOSAURS lived in very WARM places.
7. There was more WATER on the EARTH during the days of the DINOSAURS (less land areas.)
8. DINOSAURS were very large ANIMALS (some ate FLESH while others ate PLANTS)... while others were very SMALL.
9. Some DINOSAURS grew to be 10 to 12 feet TALL.
10. Some DINOSAURS ate only PLANTS and grew to be as big as a house.
11. Some DINOSAURS were as small as TURKEYS......RATS.....or a MOUSE.
12. DINOSAURS were REPTILES.
13. DINOSAUR BONES can be seen today at the big MUSEUMS.
14. Some Museums have put together the DINOSAUR BONES (even covering the BONES with a SKIN).
15. DINOSAUR TEETH have lasted over the years.

LESSON 24:

"More About Plants and Animals of Long Ago"
"Extinct Animals"
"Endangered Plants and Animals"

(Textbook supplement - 232 -- 245)

MAIN IDEAS:

- Fossils of dinosaur footprints and ancient plants have been found.
- Winged reptiles and aquatic reptiles lived at the same time as dinosaurs.
- Dinosaurs are extinct.
- Many animals are extinct.
- A wide variety of plants and animals are endangered today.

OBJECTIVES:

-- To describe fossils of dinosaurs footprints and ancient plants.
-- To describe other animals that lived at the same time as dinosaurs.
-- To state that dinosaurs are extinct.
-- To explain why some animals are extinct.
-- To describe plants and animals that are endangered.
-- To discuss ways to prevent the extinction of additional kinds of plants and animals.

KEY WORDS:

FOSSIL	DINOSAUR	PLANT	ANIMALS	DECAYS
MINERALS	SHAPE	TEETH	MAN	EARTH
HUGE	TONS	TALL	TURKEYS	RATS
FOOTPRINTS	FOSSIL	MUD	MATERIAL	WATER
HARD	SAND	PRESSURE	PRINT	FEET
LEGS	SWAM	FLEW	REPTILES	WINGS
COAL	PLANT	FERNS	COAL FIELDS	OCEAN
LAVA	VOLCANOES	DISEASE	CLIMATE	DINOSAUR EGGS
COLD BLOODED	EXTINCT	MAMMOUTH	ELEPHANT	PRESERVED
FROZEN	SKELTONS	DO-DO BIRDS	TAR PITS	FOOD
MILLIONS	LAWS	PROTECT	WHOOPING CRANE	SABRE TOOTH TIGERS
PASSENGER PIGEONS				

REVIEW:

1. FOSSILS tell us most of what we know about DINOSAURS.
2. A FOSSIL is a PLANT or an ANIMAL that has died and DECAYS (trapped in mud or something like that) little MINERALS take their place and leaves the exact SHAPE as the PLANT or ANIMAL.
3. TEETH usually last and are not FOSSILS.
4. Most of the DINOSAURS died before MAN was here on EARTH.
5. Some DINOSAURS were HUGE and weighed many TONS; and were 20 or 30 feet TALL.
6. Some of the very big DINOSAURS were PLANT eaters.
7. Some of the DINOSAURS were as small as TURKEYS and RATS.

MAIN POINTS:

1. We've learned a lot about DINOSAURS by looking at their FOOTPRINTS.
2. FOOTPRINT FOSSILS were made when the ANIMALS stepped in soft MUD and the MUD dried (or some other kind of MATERIAL was washed there by WATER into the FOOTPRINT after it was HARD for a long time......or maybe it was blown by SAND and then covered with MUD and put under PRESSURE for a long time and it made a PRINT).
3. Some DINOSAURS had FEET and LEGS.
4. Some ANIMALS of long ago SWAM and FLEW.

5. Some REPTILES had WINGS and could FLY long ago.
6. One of the best places to find FOSSILS is in COAL.
7. Lot of PLANT FOSSILS can be found in COAL (FERNS).
8. Indiana has COAL FIELDS (Terre Haute, Brazil).
9. Lots of FOSSILS can be found in our state (Southern Indiana).
10. At one time, part of Indiana was under an OCEAN.
11. Artists have drawn pictures to show us what it was like before the days of the DINOSAURS.
12. Hot LAVA from VOLCANOES covered many PLANTS and ANIMALS.
13. The DINOSAURS have disappeared because of DISEASE or other ANIMALS ate the DINOSAURS' EGGS.
14. Some people think the CLIMATE became COLD and killed the DINOSAURS.
15. The DINOSAURS were COLD BLOODED and they became very inactive when the CLIMATE got COLDER.
16. EXTINCT means there aren't any more of them.
17. The MAMMOUTH is closely related to the ELEPHANT.
18. Some ancient ANIMALS were PRESERVED by being FROZEN.
19. SABRE TOOTH TIGERS are EXTINCT (SKELETONS of some ANIMALS were found PRESERVED in the TAR PITS of California.
20. The DO-DO BIRDS were killed mostly for FOOD.
21. ANIMALS(and PLANTS) become EXTINCT because people kill them or take away the place where they lived.
22. The last PASSENGER PIGEON died in 1914 in Cincinnati, Ohio.
23. At one time, there were MILLIONS OF PASSENGER PIGEONS (people ate them).
24. LAWS need to be made to PROTECT the PLANTS and ANIMALS.
25. The WHOOPING CRANE (very few left) are PROTECTED by LAWS.

3RD GRADE SCIENCE

SOUTH BEND COMMUNITY
SCHOOL CORPORATION

FOREWORD

Since you are required to teach twenty-four weeks of science, "3rd Grade Science" is a radio supplement of twenty-four lessons based on the adopted textbook. Each lesson has been developed to coincide with approximately one week's work in the textbook. These radio lessons go through the textbook page by page and expand each topic above and beyond what has been presented by D.C. HEATH. These lessons are not meant to replace your science instruction but are to be a vital supplement to it.

You will find that the guide for each lesson includes a list of KEY WORDS. These are words that may be new to the student, may be somewhat difficult for a 3rd grader, or may be strictly scientific terms. You may want to discuss these KEY WORDS before the broadcast and even place them on the chalkboard. These words have been listed only so that special attention will be devoted to them so that the student may be assured the fullest possible understanding of the radio lesson. They are in no way intended to become spelling or vocabulary lists. You will also note that the MAIN POINTS might be brought to the attention of your students previous to listening to the lesson as a means of alerting them to listen for particular information. At other times, you may wish to use these points as a guide for discussion following the broadcast.

The program format, using dialogue between teacher and students, has been used in an attempt to develop a fast-moving pace to get an "over-view" of the textbook material. Our primary goal as this series of radio lessons was being developed was to make them both educational and supplementary to the printed material.

This series of radio lessons was produced entirely by WETL Radio, and credits are due to a number of people. Bob McDermott was our announcer, and the students who so willingly and freely gave of their time to appear on the lessons were Laura Moran, Eric Werge, Brian Powell, Michael Limbert, and Sean Chiszar. Special credit must be given Jerry Limbert, who did volumes of research developing the basic script . . and for the excellent work he did in recording and editing the broadcast tapes . . as well as preparing this Teacher Manual.

I hope that you and your 3rd grade students will enjoy using these supplementary radio lessons as much as we enjoyed producing them.

Sincerely,

Mr. Dee

John V. Davis (Mr. Dee)
Coordinator of Health Education/Science

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3rd GRADE SCIENCE

Radio Lesson		HEATH SCIENCE pages
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3rd GRADE SCIENCE

LESSON 1

"Where Do Plants and Animals Live?"
"A Wet, Dark Place"
"A Hot, Dark Place"

(Textbook supplement - pages 1 -- 14)

Purpose:

This lesson presents general information about living things and their environment.

SUMMARY:

Mr. Dee is assisted by Jennifer and Michael as they explore the text page by page.

KEY WORDS:

RABBITS
FIELD MICE
GARTER SNAKE
JADE PLANT
CALIFORNIA MOLE
EARTH WORMS
PAPER WASP
CELLULOSE
TURTLE
REPTILES
SALMONELLA
DESERT
TEMPERATURE
PACK RAT
HORNED TOAD
RATTLESNAKE

MAIN POINTS:

1. Animals can be found almost anywhere in the world.
2. The woods is a good place to see some of the world's animals.
3. If you stop for a moment you may hear the call of wild birds, sounds of insects, or the splash of a frog as it jumps into a forest pond.
4. Animals are all around us . . . the world is full of living things.
5. Some of the animals living in a grassy meadow are RABBITS . . . FIELD MICE . . . GARTER SNAKES . . . and EARTH WORMS.
6. GARTER SNAKES live around the South Bend area and are not harmful to man. GARTER SNAKES eat insects, worms and frogs . . . and are very helpful and should be encouraged to have around.
7. GARTER SNAKES are different from many other American snakes. They like to live in the parks and cities and towns.
8. GARTER SNAKES can be found in back yards and gardens in the Spring and warm Autumn weather.
9. Most snakes in the South Bend area are harmless and very helpful so we should leave them alone to do their work of eating mice and insects. Unless you know for sure that a snake is harmless, it's always a good idea to stay away from it . . . but, there is no need to be overly frightened or become hysterical as many people do whenever they encounter a snake.
10. A PAPER WASP is the "papermaker" of the insect world. They build their nests of wasp "paper" . . . which is a mixture of old wood and tough plant fibers.

11. PAPER WASPS chew the wood and plant fibers into a "pulp" . . . using much spit--or saliva. They form it into their nests. It is then real paper, made of CELLULOSE, just like the paper on which your textbook is printed.
12. Most WASPS are helpful to man.
13. WASPS sometimes damage fruit, but they also destroy large numbers of harmful insects and caterpillars. WASPS do far more good than harm.
14. The best thing to do if you come upon WASPS is to leave them alone. They can give you a mean sting. You never want to mess with their paper nest for there may be hundreds of WASPS living there.
15. Not all TURTLES live in water. TURTLES are REPTILES that are easy to recognize by their shells.
16. There are many kinds of TURTLES in the world . . . and each of them has a special kind of shell pattern.
17. Some TURTLES, such as a "Snapping Turtle" might bite you . . . but as a rule, TURTLES have no teeth . . . but they have jaws with horny edges that can cut through hard things like limbs up to several inches thick.
18. TURTLES eat fish as well as some plants. Some water TURTLES will not swallow unless their heads are below the water.
19. TURTLES used to be kept as pets . . . but this is not a good idea for they can carry a disease, SALMONELLA. SALMONELLA is like having the flu for many weeks.
20. EARTHWORMS are strange creatures. Instead of eyes, they have a pair of "spots" on each section that are sensitive to light.
21. EARTHWORMS are valuable to farmers. They feed upon the rotted and decayed vegetable matter.
22. EARTHWORMS drop tiny piles of dirt called "castings". These "castings" make the top soil more fertile and the crops will grow better in fertile soil.
23. Some people use EARTHWORMS for bait when they fish.
24. A DESERT is a very dry place that often has no water for months.
25. Many animals in the DESERT sleep during the day in holes dug under the sand or under rocks where it is much cooler.
26. DESERTS are places where you can have hot and cool TEMPERATURES.
27. DESERTS usually have less rain, more wind, and higher TEMPERATURES than other places in the world.
28. Whenever it does rain in a DESERT, it rains very, very hard . . . often causing floods.
29. Many DESERT animals live on the cactus plant. The PACK RAT . . . the HORNED TOAD . . . and the RATTLESNAKE are animals that live on live DESERT food.
30. The cactus palnt can be used by both man and animal on the DESERT.
31. The cactus plant can be used for food . . . and it is a good source for water.
32. The JADE PLANT has thick, fleshy, green leaves.
33. The JADE PLANT has unusual shaped leaves and can be grown in people's houses.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Collect pictures of plants and animals and display them in the classroom.
3. Distribute a small piece of paper to each child. Ask the children to write on the paper the name of a plant or animal with which they are familiar.

LESSON 1 (continued)

4. Discuss various plants and animals. Ask the children to decide where each plant or animal lives. Have them in turn read the name to the class and state where they think the plant or animal lives.
5. Write the word "organism" on the chalkboard. Tell the children that an organism is any living thing. Ask the children to tell about some of the organisms they studied in this lesson.
6. Have the children bring in pictures of different kinds of plants and animals for a bulletin board display. The pictures of the organisms can be grouped according to where they live. For example, group all organisms that live in the water together. Look for organisms that live in more that one place.
7. Discuss how earthworms loosen the soil and make tunnels for water to saturate.
8. Have the children bring in pictures of desert areas and discuss what kind of plants and animals live there.
9. Perhaps a Jade plant or cactus plant could be brought to class for the children to examine.
10. Have the children draw a picture of a desert showing the plants and animals that can be found there.

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LESSON 2

"Many Plants, Animals, and Places"
"Animals On The Move"

(Textbook supplement - pages 15 -- 25)

Purpose:

This lesson presents general information about plants and animals and where they live.

SUMMARY:

Mr. Dee is assisted by Jennifer and Michael once again as they explore the textbook page by page.

KEY WORDS:

SUBSTANCES
SUNFISH
HABITAT
STORKS
SNAILS
LIZARDS
DUCKS
DOWN
MIGRATION
MAMMALS
SPERM WHALES
BLOW HOLES
MONARCH BUTTERFLIES
CARIBOU
HERD

MAIN POINTS:

1. Plants and animals are different from each other in two important ways. First, plants can not move by their own power as animals can, and, second, animals can not make their own food as plants do.

2. Plants can make their own food out of SUBSTANCES drawn in through their roots and leaves . . . but animals can not do this. Animals use food that is "ready-made" in the form of plants or other animals.
3. Many water animals look like "plants" growing on the rocks or in the sand beneath the water.
4. A pond is a good place to find a SUNFISH.
5. SUNFISH must live in a lake or pond where living conditions are just right.
6. A HABITAT is the place where a certain animal or plant would naturally live and grow.
7. SUNFISH need "fresh water" and would die if placed in the ocean's "salt water".
8. STORKS are large birds with long legs and strong wings . . . and their HABITAT is marshes and swamps.
9. In Europe, the STORK is a respected and protected bird . . . especially in Germany and Holland. The Germans and the Dutch like STORKS because they destroy insects and reptiles. Many of these people believe the STORK brings them "good luck".
10. SNAILS are slow-moving animals and are usually found in damp places under logs and stones, at the edges of ponds and rivers, and in damp woods.
11. The HABITAT for a LIZARD is a very warm place. LIZARDS cannot keep their bodies much warmer or cooler than their surroundings.
12. LIZARDS must live in regions where the soil seldom freezes so they can dig down into it to sleep through the winter.
13. LIZARDS like to live in the tropics the best. In deserts and other dry regions, LIZARDS are more common than any other reptile.
14. When the desert becomes too hot for comfort, the LIZARDS lie in the shade or hide a short way below the surface of the sand, or in burrows under rocks to escape the fierce rays of the sun.
15. Many big fern plants live in a "rain forest".
16. A "rain forest" is the HABITAT for many unusual plants and animals.
17. DUCKS move from place to place, seeking a good HABITAT.
18. The "mallard" is the most important of all wild DUCKS. "Mallards" have been used as food for man. Many tame DUCKS we see in city parks are related to the "mallard".
19. Mother DUCKS lay from six to perhaps sixteen eggs in a warm nest made of leaves, dry grass, and other materials. Sometimes two DUCKS may lay eggs in the same nest.
10. The nest is also lined with DOWN. DOWN are the soft feathers which the mother DUCK takes from her breast.
21. DUCK nests are usually built on the ground near water.
22. There are some kinds of DUCKS that build their nests in hollow trees.
23. The mother DUCK remains almost constantly on the nest from three to four weeks. DUCK eggs usually take about 28 days to hatch. When the ducklings come out of the eggs they are covered with DOWN. The mother leads the ducklings to water as soon as they can travel.
24. Ducklings cannot fly for six weeks or more after they are hatched.
25. DUCKS have a large oil gland above their tail . . . and they keep their feathers well-oiled. This oil makes their feathers "waterproof" and helps to keep the DUCK from sinking.
26. DUCKS follow the warm weather by MIGRATION routes.
27. In the wintertime, DUCKS fly to the south . . . and when it's summer here, they fly back north to warmer places. This traveling is called MIGRATION.
28. The word DUCK means "female" . . . while "Drake" is the "male". A duckling is the name of the young.
29. DUCKS have been known to MIGRATE thousands and thousands of miles.

30. SPERM WHALES are air-breathing MAMMALS that live in the ocean. Even though they look like "fish", they are more closely related to man.
31. The WHALE is the world's largest animal. Perhaps the most amazing thing about the WHALE is not its huge size, but the fact that it is a water MAMMAL and not a "fish" at all.
32. Since the SPERM WHALE is a MAMMAL, the baby WHALE is fed on its mother's milk . . . like other baby MAMMALS. WHALES are not hatched from an egg but are born alive. . . and for a while after it is born, it stays with its mother.
33. WHALES have "lungs" and they can stay underwater for almost three-quarters of an hour. On the top of the SPERM WHALE's head are one or two BLOWHOLES.
34. The BLOWHOLES make it easier for WHALES to breathe at the surface of the water. Perhaps you've seen pictures of WHALES blowing water out of their BLOWHOLES.
35. When a WHALE goes under the water, it holds its breath. The air in its lungs becomes hot and full of moisture. When the WHALE reaches the surface, it "blows" or "blows out its breath". The hot breath strikes the colder outside air and "condenses", forming a "spout" or water column of "fog".
36. WHALES live in all the oceans of the world. Every summer, many kinds of WHALES MIGRATE or travel to cold waters to feed. In winter, some swim to warmer waters to "breed".
37. SPERM WHALES live in groups of several hundred animals. These groups are called HERDS.
38. CARIBOU is the French-Canadian name for the wild "reindeer" of North America. CARIBOU graze in grassy meadows and MIGRATE from place to place.
39. CARIBOU move in large HERDS far across the Arctic "tundra" from Newfoundland all the way to Alaska. The CARIBOU eat their way across Canada.
40. MONARCH BUTTERFLIES can be found right here in South Bend during the summer.
41. Usually in September, the MONARCH BUTTERFLIES gather to fly south.
42. MONARCH BUTTERFLIES fly all the way to Mexico to lay their eggs.
43. Millions and millions of MONARCH BUTTERFLIES can be found in the forests of Mexico during this time of year.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Write the word HABITAT on the chalkboard. Discuss its meaning with the children.
3. Find pictures of STORKS, SNAILS, LIZARDS, DUCKS, and WHALES and display them on the bulletin board, Have the children tell where each live and what each need for food.
4. Talk about fish and how they adapt themselves to live underwater. Ask the children to tell you how they think the gills, fins, and scales of a fish help it to live in water. (Gills help the fish "breathe" . . . fins help the fish move in whatever direction it needs to . . . and scales protect it.)
5. Bring a SNAIL to class and have the children observe its movements with a magnifying glass. Point out its shell . . tentacles . . foot . . and mouth.
6. Discuss how the SNAIL protects itself from its enemies. (The tentacles have the eyes on them . . . the foot is muscular and is used for moving . . and the mouth takes in food.)
7. Discuss why some animals and birds MIGRATE from place to place.

LESSON 2 (continued)

8. Ask the children to explain the survival value of the ducks building their nests and laying their eggs in the spring. (The ducklings can grow strong while the weather is warm and food is abundant.)
9. Write the word MIGRATION on the chalkboard. Animals that migrate usually go back and forth between only two places . . often a summer and a winter home. (Be sure the children know that not all ducks MIGRATE.)
10. Emphasize the idea that some animals, such as MALLARDS must MIGRATE when the change of seasons causes the conditions of their HABITAT to change.
11. Use a classroom map and trace the MIGRATION of some DUCKS. (page 22)
12. Point out that very different types of animals migrate. (Butterflies fly and have no skin, hair, or skeleton . . CARIBOU walk . . .WHALES swim . . etc.)

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LESSON 3

"Groups of Living Things"
"Populations"
"How Populations Grow"

(Textbook supplement - pages 29 -- 43)

Purpose:

This lesson presents general information about groups of living things.

SUMMARY:

Mr. Dee is assisted by Brian and Wanda as they explore the textbook page by page.

KEY WORDS:

HABITAT
MUSHROOMS
POPULATION
YELLOW GOATFISH
CRABS
CUTTING
ROOKERY
SEA LION
HERD
ELEPHANTS
SWARM
LADY BEETLES
MOOSE
CALVES
DANDELION
BARNACLE
BURS
SPIDERS
MINERALS
DECAY
CORAL

MAIN POINTS:

1. A grassy meadow is the HABITAT for groups of living things.
2. Plants and animals live in their HABITAT.
3. A HABITAT is a place where certain plants and animals would "naturally" live and grow.
4. SPIDERS are helpful to man because they eat insects such as locusts and grasshoppers which destroy crops.
5. SPIDERS also eat flies and mosquitoes which can carry disease.

LESSON 3 (continued)

6. MUSHROOMS or toadstools, as you might call them, are often overlooked in a meadow . . . but they are very important. They help to DECAY materials so that MINERALS will be available for other plants to use as they grow.
7. Groups of plants and animals live in POPULATIONS.
8. A POPULATION of YELLOW GOATFISH live in "schools".
9. YELLOW GOATFISH live in warm, tropical waters along with CORAL.
10. A SEA LION is the name some people give to certain large-eared seals.
11. SEA LIONS live in a POPULATION known as a ROOKERY.
12. Most ROOKERIES are on islands or beach areas.
13. ROOKERIES may have only a few hundred members . . . or be as large as 150,000 members.
14. People live in POPULATIONS, too.
15. The word POPULATION really means a number of "people".
16. BARNACLES live in salt water on rocks, other animals, shells, and on the hulls of boats.
17. BARNACLE POPULATIONS grow very fast and often become very large in number.
18. POPULATIONS of BARNACLES can become so great that they slow down the movement of large ships . . . and the ships must be brought into harbor to have the BARNACLES removed.
19. CRABS live in POPULATIONS along the seashore in shallow water.
20. ELEPHANTS live in Africa where the HABITAT is perfect for them to live and multiply.
21. ELEPHANTS live in POPULATIONS called a HERD.
22. LADY BEETLES are sometimes called "lady bugs".
23. LADY BEETLES are very fine insects to have around and should never be killed.
24. LADY BEETLES eat many of the insects that damage our plants . . . and they should be kept in our garden or even in our homes on our house plants.
25. LADY BEETLES live in a POPULATION called a SWARM.
26. MOOSE are members of the deer family . . . only a MOOSE is larger than a deer.
27. A young MOOSE is called a CALF.
28. Animal POPULATIONS have both old and young animals living together.
29. Many people grow "hens and chicken" plants in pots and planters.
30. The adult plant is called the "hen" . . . while the new young plants are the "chickens".
31. Trees grow from seeds . . . and in time, the trees will produce seed that will also grow into trees.
32. Trees live in POPULATIONS called woods, forests, and jungles.
33. Many of the tree seeds will be eaten by animals and not grow into trees.
34. The seeds of DANDELION are spread over a large area by the wind.
35. Each tiny DANDELION seed is fastened to a kind of "parachute" . . . and can travel a long way.
36. It's a good thing that all of the DANDELION seeds don't root and grow, if they did our world would be over-POPULATED with DANDELIONS.
37. Maple tree seeds have "propeller-type" wings that let them spiral down toward the ground.
38. BURS have needle-like stickers that can cling to animal's fir or a person's clothing.
39. BURS can be carried a long way and deposited.
40. Some seeds (apple, orange, etc.) can be thrown from a car a very long way from the original tree.
41. Sometimes, birds and animals will eat seeds and then deposit them with their wastes.
42. Many plants will grow from CUTTINGS made from old plants.
43. When a plant is grown from a CUTTING it does not start as a seed.

LESSON 3 (continued)

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Have the children draw a picture of different kinds of organisms that can live in the same HABITAT.
3. Have the children draw a picture of different kinds of organisms that can not live in the same HABITAT.
4. Display a picture of a crowd of people. Discuss how this is a POPULATION of "people".
5. Bring to class a map of the state. Discuss where the most and least POPULATED areas are. Ask the class why this is so.
6. Review the many ways that seeds can travel from place to place.
7. Bring an apple to class and remove the seeds. Discuss how each tiny seed is capable of growing an apple tree. (Cut the seed in two halves and study the internal structure.)
8. Discuss how plants can grow from CUTTINGS. (Discuss the advantages of growing plants from CUTTINGS . . . hybrid plants and fruits.)

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LESSON 4

"How Populations Live and Work"
"How a Population Gets Smaller"

(Textbook supplement - pages 46 -- 53)

Purpose:

This lesson presents general information about groups of living things.

SUMMARY:

Mr. Dee is assisted by Brian and Wanda once again as they explore the text page by page.

KEY WORDS:

POPULATIONS
BEAVER
LODGES
DAM
COLONIES
HIVE
QUEENS
WORKERS
DRONES
LARVAE
SOLDIERS
TERMITES
HILLS
BABOONS
ANTS
SALIVA
COLONIES
NATURAL HABITAT
PASSENGER PIGEON
FOSSILS
CLIMATE

MAIN POINTS:

1. If you've ever been to a swamp you'll notice that there are POPULATIONS of plants and animals that live together.

LESSON 4 (continued)

2. POPULATIONS are groups of living things made up of the same kind of plants or animals . . . and POPULATIONS live and grow together in their NATURAL HABITAT.
3. BEAVERS live in "family groups" and have as many as a dozen family members.
4. A BEAVER family includes the parents . . . the young born the year before . . . and this year's new babies.
5. The BEAVER builds a DAM by cutting down and chewing sticks and twigs.
6. BEAVERS live in structures made mainly of branches called LODGES.
7. BEAVERS eat the bark, twigs, leaves, and roots of trees and shrubs.
8. BEAVERS especially like to eat the roots and tender sprouts of water lilies.
9. The BEAVER enters the LODGE under the surface of the water . . . then moves to the floor which is about 4 to 6 inches above the water. Here young BEAVERS can stay warm and dry during the winter months . . .and the adults can dry off after bringing in food.
10. LODGES are not built air-tight . . . and their are holes between the branches in the ceiling to let fresh air in.
11. Bees live in HIVES which people build for them.
12. Honeybees are "social" insects that live in hollow trees or in HIVES.
13. The "QUEEN" bee controls the HIVE and lays the eggs.
14. Bees make honey from pollen. Men who keep bees always leave plenty of honey in the HIVES so the insects can eat and keep warm during the cold weather.
15. QUEEN honeybees that live in the North begin to lay eggs in March.
16. Most of the eggs hatch and grow up into WORKERS . . . but some become SOLDIERS.
17. The QUEENS and some males fly high into the air when they mate, but the males soon die afterward.
18. Males that do not mate stay in the HIVES and are called DRONES.
19. DRONES are smaller than QUEENS but larger than the WORKERS, but DRONES cannot get their own pollen or nectar.
20. WORKERS feed the DRONES when there is plenty of food . . . but when food is scarce the DRONES get nothing and sometimes starve.
21. The QUEEN honeybees lay so many eggs that their HIVES become crowded. When this happens, the WORKERS build some extra large cells that are irregular instead of six-sided. LARVAE in these cells are fed a special kind of "jelly" that makes them grow into QUEENS.
22. ANTS and bees live in large groups and share work assignments.
23. ANTS live in HILLS and can be found in all parts of the world. More ANTS live on the earth than any other insect.
24. ANTS live and work in groups called COLONIES.
25. TERMITES are insects that live in communities somewhat like the ANTS and bees.
26. TERMITES are actually related more closely to cockroaches and grasshoppers.
27. TERMITES live in COLONIES and divide the work assignments. In some areas of Africa, TERMITES build HILLS that they live in which can be many feet high. Some of the natives of Africa use TERMITES as food.
28. Paper Wasps live and work together just like bees. They are called "paper wasps" because they make their nest of a special "paper-like" material which they produce from chewing up plant fibers and mixing it with their SALIVA.
29. BABOONS live in groups of 10 to 80 animals.
30. In a BABOON community, a large male usually is the "ruler".
31. Male BABOONS can be fierce fighters and have even attacked leopards.

LESSON 4 (continued)

32. Many of our American zoos have BABOONS
33. Plants and animals live in a NATURAL HABITAT.
34. Many NATURAL HABITATS have been changed by men building shopping centers and malls.
35. When NATURAL HABITATS have been changed or destroyed, there is a danger that some plants and animals may die out.
36. One example of this is the PASSENGER PIGEON.
37. The PASSENGER PIGEON, which once lived here in North America, once numbered in the millions . . . they even made the sky black when they flew in groups. . . . but hunters killed them off for food in such numbers that they became "extinct". Today, there are no living male or female PASSENGER PIGEONS.
38. Some of the FOSSILS we find in rocks or coal show us types of plants and animals that are "extinct" today.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Have the children draw a picture of a BEAVER DAM. (The DAM is made of many pieces of twigs , mud, stones, and grass.)
3. Emphasize the idea that the BEAVERS work very hard constructing the DAM. (They must make many trips to gather materials.)
4. Find pictures in books, newspapers, or magazines showing BEAVER DAMS.
5. Discuss life in a bee HIVE or life in an ANT HILL. (Both are social insects ruled by a QUEEN with the work load distributed.)
6. Draw a picture of the inside of a bee HIVE.
7. Draw a picture of the inside of an ANT HILL.
8. Discuss "natural habitats" of various animals.
9. Learn more about the Whitetail Deer. Assign student reports . . . student drawings, etc.

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LESSON 5

"A Community"
"Looking at a Community"
"Food and Energy"
"Plants and Water"
"Soil-Makers"

(Textbook supplement - pages 57 -- 69)

Purpose:

This lesson presents general information about living things and environments.

SUMMARY:

Mr. Dee is assisted today by Dale and Margaret as they explore the textbook page by page.

LESSON 5 (continued)

KEY WORDS:

POPULATIONS
HABITAT
LION
RESERVES
EGRETS
SANCTUARIES
GIRAFFE
SAVANNAS
ZEBRAS
ENERGY
SUNFLOWERS
CHLOROPHYLL
ROOTS
LEAVES
STEMS
FUNGI
SPORES
DECAY
BACTERIA
BROWN CREEPER
MINERALS

MAIN POINTS:

1. Africa is a continent where animals live near rivers, waterfalls, lakes, mountains and meadow grasslands. (Some animals eat grass and leaves of tall trees, while other animals eat each other.)
2. POPULATIONS of plants and animals that live together in the same HABITAT make up what we call a "community".
3. LIONS, ZEBRAS, GIRAFFES, vultures are animals that live in the African grasslands or plains HABITAT.
4. The LION is called the "king of beasts" because the animal is so powerful.
5. The LION must kill in order to have food. (Some authorities say that LIONS are really cowardly.)
6. In ancient times LIONS lived in Europe . . . the Middle East . . . India . . and much of Africa. (Man has killed the LIONS as he settled in new areas. As a result, there are no LIONS left in Europe, the Middle East, and Northern Africa . . . and only a very few are still living in India today.)
7. Today, LIONS are found mainly in east and central Africa . . and most of these LIONS live in national parks and areas called RESERVES. (RESERVES are acres of land that have been set aside for wild animals to live in safety.)
8. EGRETS are the white birds that feed on insects stirred up by grazing cattle. (Originally from Asia, EGRETS were first seen in Florida in 1942. They are now fairly common in many parts of the United States.)
9. Plume hunters used to kill so many EGRETS that there was danger none would be left . . . but the Audubon Society, and state and federal game wardens now protect them, and their number is increasing.
10. The Audubon Society has purchased some of the HABITATS and developed these areas known as SANCTUARIES to protect the EGRETS.
11. The GIRAFFE is the tallest of all animals . . . adult males may grow nearly 18 feet tall (that is 5 feet taller than the African elephant).
12. The GIRAFFE gets its great height from its 6-foot-long legs and a neck that may be more than 6½ feet long.
13. GIRAFFES live south of the Sahara desert (Africa) in grasslands called SAVANNAS.
14. SAVANNAS are grasslands with scattered trees.
15. GIRAFFES eat leaves, twigs, and fruit. The GIRAFFE, like the cow, chews a "cud" . . . food that has entered the stomach and returned to the mouth for a second chewing.
16. A ZEBRA is a horse-like animal also found wild in Africa.
17. The ZEBRA has black and white stripes over its body . . the lines may appear even on the ZEBRA's long ears . . . short, thick mane . . . and down its tail.
18. The black and white striped lines help to hide the ZEBRA from its enemies.
19. Food gives living things ENERGY.
20. "ENERGY" is the name given to the ability to do work. All human and animal life depends upon ENERGY. (ENERGY on earth comes from the sun and is stored up in coal, wood, and oil, which man burns to do work for him.)

21. Coal and oil were made from plants.
22. SUNFLOWERS, like all other plants, store the sun's ENERGY.
23. When birds and people eat SUNFLOWER seeds, they are taking stored ENERGY from the sun into their bodies. (This ENERGY, from the food that the SUNFLOWER plant makes, is then used by birds and people to help them live and grow.)
24. CHLOROPHYLL is the green matter that plants have.
25. Green plants, such as grass, with the help of CHLOROPHYLL and ENERGY from the sun make their own food in their LEAVES and STEMS.
26. ROOTS are long, underground branches of the plant's trunk.
27. The ROOTS anchor a plant in the ground . . . and they absorb water with dissolved minerals from the soil.
28. If we could take all the ROOTS from a tree and lay them end to end . . . they would probably reach a hundred miles or more . . . and most of the ROOTS could only be seen with a magnifying glass.
29. There really is more of the tree under the ground than above the ground.
30. FUNGI is the name of a group of simple plants that have no green coloring. (FUNGI contain no CHLOROPHYLL.)
31. FUNGI grow from SPORES instead of seed . . . and the SPORES are microscopic and are usually carried on the wind.
32. Since FUNGI do not contain the green coloring matter CHLOROPHYLL, they cannot make their own food . . . and therefore must use other plants or animals for their food.
33. The BROWN CREEPER pecks away at a dead tree or log and helps to break it down . . . therefore helping the tree to DECAY.
34. Insects live in the DECAYING matter . . . therefore helping the tree to further DECAY.
35. The DECAYING body of a tree will eventually be eaten away by insects, BACTERIA and FUNGI.
36. All DECAYED materials will be returned to the soil to enrich it with MINERALS for other green plants to use.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Write the word "community" on the chalkboard and discuss its meaning.
3. Discuss with the class what both plants and animals give to their "community".
4. Draw a picture of a plant "community".
5. Draw a picture of an animal "community".
6. Discuss the importance of the sun to our earth.
7. Draw a picture of how plants use the sunlight to make their own food.
8. Grow two plants . . . one in the sunlight and the other under a box. Discuss why one lives and the other one dies.
9. Discuss how plants die and decay, thus making minerals that are returned to the soil.
10. Discuss the composition of some soils (from decayed plants . . . from decayed animals, etc.)

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LESSON 6

"Animal-Eaters and Plant-Eaters"
"A Food Chain"
"Staying Alive in a Community"
"Changes in a Community"

(Textbook supplement - pages 71 -- 93)

Purpose:

This lesson presents general information about living things and environments.

SUMMARY:

Mr. Dee is assisted today by Brenda as they explore the textbook page by page.

KEY WORDS:

PLANT-EATERS
ANIMAL-EATERS
FOOD CHAIN
BACTERIA
CAVITY

COMPOUNDS
ENRICH
CRAYFISH
PRAYING MANTIS
TENTACLES

ANOLE
RACCOON
CHICKADEE
ANEMONE
SKUNK

BOX TURTLE
PROTECTIVE COLORATION
OPOSSUM
HEDGEHOG
EARWIG
PORCUPINE

MAIN POINTS:

1. Plants and animals live in a "community" where there are PLANT-EATERS and ANIMAL-EATERS.
2. The sun's energy goes into the plants and animals.
3. Some of the fish in a pond community are PLANT-EATERS, so they eat the green plants and get the stored energy from the sun.
4. Some of the larger fish are ANIMAL-EATERS and they get the energy from the sun in the plants.
5. The sun's energy goes into the green plants that people eat . . . and the sun's energy goes into the green plants that are eaten by animals . . then we eat the animals.
6. People, like all other living things, need energy from food.
7. The term FOOD CHAIN is used by scientist to show "who-eats-whom".
8. A typical FOOD CHAIN might be:

   A grasshopper eats the leaves of green plants. The grasshopper may, in turn, be eaten by a frog or toad, which, in turn, may be eaten by a snake. The snake, in turn, may be eaten by a hawk. The hawk dies of old age and is decomposed by BACTERIA and made into COMPOUNDS that can again ENRICH the soil and help green plants to grow.
9. A FOOD CHAIN is when one thing eats another thing, and, in time, everything starts all over again. It's a "chain" that has no real beginning or end.
10. Some dead fish decay and ENRICH a pond community.
11. Sometimes man will change a plant and animal community by destroying forest and pond areas.

12. Sometimes "nature" will also turn a healthy plant and animal community into a wasteland. (Drought . . . flood . . . etc.)
13. Many animals have body parts that they use to grab their food. (Claws, beaks, etc.)
14. The CRAYFISH attacks quickly to grab something to eat. (If you have ever tried to catch a CRAYFISH you know how fast they can move. If you have ever had one pinch, you also know how strong the CRAYFISH's claws are.)
15. The PRAYING MANTIS has six long legs and the two large front ones are used for grabbing and holding food.
16. The ANOLE is a member of the lizard family. They live on insects which they can catch with their long, fast tongue.
17. The RACCOON is related to the "panda".
18. RACCOONS are like bears, in that they eat almost anything that comes their way.
19. Among the favorite foods, the RACCOON likes frogs, CRAYFISH, turtles, and other fresh-water animals.
20. RACCOONS are great corn eaters . . . and can ruin corn crops with their visits.
21. Some of the RACCOON's worst habits are robbing birds' nests and raiding chicken coops.
22. The Black-capped CHICKADEE eats lots of insects.
23. The CHICKADEE is a small bird, growing only to about 4 or 5 inches long.
24. The CHICKADEE gets its name from the song that it sings.
25. Farmers consider the CHICKADEE valuable because they eat moths, caterpillars, beetles, and other insects. CHICKADEES also eat weed seeds.
26. The ANEMONE is an animal that lives in the clear, shallow water of the ocean.
27. The Sea ANEMONES capture food with their TENTACLES. Stinging cells in the TENTACLES throw out tiny poison threads that "paralyze" other small animals and tiny fish . . . then the TENTACLES drag the "prey" into the mouth.
28. The ANEMONE's "mouth" is right in the center of the animal. The mouth leads directly to a large CAVITY where the food is digested.
29. When anything bothers the ANEMONE, it pulls in its TENTACLES and shortens its body. When it does this, it looks like a round lump on a rock. (Sea ANEMONES move about from place to place by sliding very slowly on rocks and corals.)
30. Whenever animals blend into their surroundings, they are said to have PROTECTIVE COLORATION.
31. The HEDGEHOG's body looks just like a pile of needles.
32. No other animal will bother the HEDGEHOG when he looks like a pile of needles.
33. The OPOSSUM is an animal that plays "dead" whenever it gets in danger.
34. The BOX TURTLE can pull itself inside its hard shell for protection.
35. The SKUNK can spray bad odors at any enemy.
36. The EARWIG is an insect that has a large pair of pinchers at the rear of its body.
37. EARWIGS may be found under stones, in decayed bark of trees, and in moist places. They come out and are most active at night.
38. The PORCUPINE defends itself by sticking its enemies with the sharp "needles" that cover its body.
39. PROTECTIVE COLORATION is one of nature's way of protecting animals from their enemies.

LESSON 6 (continued)

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Review with the children the meaning of "habitat".
3. Collect pictures of PLANT-EATERS and ANIMAL-EATERS. Display them in their proper column on the bulletin board.
4. Discuss the meaning of a FOOD CHAIN.
5. Draw a simple picture showing a typical FOOD CHAIN.
6. Discuss the effects of "pollution" on a plant or animal community.
7. Have the children give examples of "pollution". (Dirty air, water, litter, etc.)
8. Describe the body parts that enable animals to protect themselves or to catch food. (Also, describe what body parts man uses to protect and to gather food.) List these on the chalkboard.
9. Find pictures in books/magazines that illustrate body parts that are used for protection and gathering food.
10. Discuss how PROTECTIVE COLORATION protects animals (and some plants).
11. Discuss how people make "changes" where they live. Discuss how some of these "changes" can be good or bad for the plant and animal community.

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LESSON 7

"Water into the Air"
"Water from the Air"
"Making Clouds"
"Making Rain, Sleet, and Snow"

(Textbook supplement - pages 96 -- 115)

Purpose:

This lesson presents general information about the earth and the universe.

SUMMARY:

Mr. Dee is assisted today by Brenda as they explore the textbook page by page.

KEY WORDS:

WATER
RAIN
GUTTERS
EVAPORATE
WATER VAPOR

PRESERVE
DEW
CONDENSATION
DEW POINT
FLAKE
FROST

MOISTURE
DROPLETS
GAS
SNOW
FOG
ICE

MIST
CLOUD
HAZE
CRYSTAL
TEMPERATURE
STEAM

LESSON 7 (continued)

MAIN POINTS:

1. Whether we know it or not, there is WATER everywhere.
2. We see the WATER in the air when it comes down to earth as RAIN.
3. RAIN WATER runs down the streets and flows into the GUTTERS.
4. GUTTERS take the WATER to underground sewers.
5. WATER will EVAPORATE when the TEMPERATURE is right.
6. WATER will return to the air when it EVAPORATES.
7. WATER EVAPORATES when it turns into a GAS.
8. WATER, in sunshine, will slowly change into WATER VAPOR when it is EVAPORATING.
9. "Drying" foods is one way to PRESERVE them.
10. The warmer the air . . . the more MOISTURE it can hold.
11. DEW forms when air carrying WATER VAPOR is cooled by touching something that is colder . . . this is called CONDENSATION.
12. When the MOISTURE in cooled air can no longer hold all the MOISTURE . . it is said to have reached the DEW POINT.
13. Heating WATER to make it "boil" turns the WATER to VAPOR.
14. When WATER VAPOR rises from "boiling" WATER, it is called STEAM.
15. When WATER VAPOR rises into the air and is cooled, it turns into a GAS called a CLOUD.
16. Sometimes, during the winter, it gets cold enough to turn the WATER VAPOR in our breath into a breath CLOUD . . . or STEAM.
17. FOG is a CLOUD that has formed near the ground or near the surface of a body of water.
18. FOG may be dense or thin . . and when FOG is thin it's often called MIST or HAZE.
19. When WATER VAPOR forms tiny droplets making it visible, we call it FOG.
20. When WATER DROPLETS hit the ground and freeze, it forms ICE on things.
21. ICE adds lots of weight on tree limbs . . . electrical wires . . and bushes.
22. Much damage can result from ICE.
23. SNOW falls to the ground as CRYSTAL FLAKES.
24. Most of the time a single SNOW CRYSTAL will attach itself to others and float to earth as a large FLAKE.
25. SNOW is frozen CRYSTALIZED RAIN which falls to earth from a CLOUD high in the air. MOISTURE from the earth's WATERS have traveled by CLOUDS until it CONDENSES and falls. If the TEMPERATURE is low it will fall as SNOW.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss with the class the pathway of the rainwater system in South Bend.
3. Change WATER (liquid) into a GAS (STEAM) by boiling.
4. Discuss what happens when it doesn't rain over a period of time. (Ponds dry up . . . a drought occurs for the area.)
5. Discuss how DEW is formed.
6. Discuss what SNOW is.
7. Discuss the DEW POINT and what it means.
8. Draw pictures of CLOUDS and discuss how they are formed.

LESSON 7 (continued)

9. Discuss some of the dangers of FOG (Driving . . walking . . etc.)
10. Discuss some of the dangers of ICE (Causing power lines to fall . . . damaging trees and plants . . . driving accidents . . . walking accidents . . etc.)
11. Discuss some of the dangers of SNOW. (Isolating people . . . poor walking and driving . . . the weight causing small buildings to be damaged . . etc.)
12. Draw pictures of a SNOW scene. Discuss how SNOW is formed.

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LESSON 8

"Water in the Ground"
"Water on the Ground"
"The Never-Ending Story"
"Storing Water"

(Textbook Supplement - pages 116 -- 129)

Purpose:

This lesson presents general information about the water cycle.

SUMMARY:

Mr. Dee is assisted today by Tom and Carla as they explore the textbook page by page.

KEY WORDS:

WATER VAPOR
DROPLETS
EVAPORATED
RESERVOIR
SOIL
MINERAL
DIVINING ROD
EROSION
SPRING
WATER CYCLE
HOOVER DAM
TURBINES
LAKE MEAD
SHASTA DAM
ELECTRICITY
IRRIGATE
AQUEDUCT

MAIN POINTS:

1. A drop of water makes many different journeys. It flows down a river into a lake. It leaves the lake and rises high into the air as WATER VAPOR. There, it turns back into water DROPLETS and becomes a cloud. Soon tiny DROPLETS form larger drops and down comes rain.
2. The raindrop falls on the ground, sinks into the SOIL and meets the roots of a tree.
3. It is taken up into the tree, carried up the trunk into a branch, and then into a leaf. The water DROPLET is given off into the air by the leaf as WATER VAPOR.
4. Again the WATER VAPOR rises in the air . . . and again it forms cloud DROPLETS.

5. This coming and going is called the WATER CYCLE.
6. When water EVAPORATES, it is changed into WATER VAPOR.
7. Sometimes, rain water is sent to lakes or a RESERVOIR.
8. A RESERVOIR is a place where extra water is kept to be used at a later time when it may be needed. (Water from a RESERVOIR may be used for drinking purposes . . irrigation . . or fighting fires.)
9. We should use the word SOIL when we talk about the material that makes up the earth's surface.
10. A great deal of rain water is stored beneath the surface of the earth.
11. Water from underground "wells" often has the taste of dissolved MINERALS.
12. Long ago, people used a forked branch called a DIVINING ROD to locate underground water deposits.
13. A person would grip the handles of the DIVINING ROD and walk around. When the DIVINING ROD pointed down to the ground, that was supposed to be where the underground water deposit was. A well would be dug on that exact spot.
14. Some well water has a very high MINERAL content and is called MINERAL WATER. (Common MINERALS that make water taste bad are "sulfur" and "iron". Sulfur in the water tastes and smells like "rotten eggs" . . while a lot of iron in the water will coat everything the water drys on with rust.
15. Water always runs down hill or from a higher to a lower level.
16. If you study the land around South Bend, the lowest places are the rivers and streams.
17. Whenever rain water flows rapidly down a hill, it can carry along some of the SOIL. Many times the SOIL will wash away and leave deep "gulleys" or "ditches". (This washing away of SOIL is called EROSION.)
18. EROSION can cause lots of damage to SOIL.
19. Sometimes underground water will find a place and come to the surface. This kind of water is called SPRING water. (It SPRINGS from the ground.)
20. The WATER CYCLE is a never ending story.
21. The WATER CYCLE has no beginning and no end.
22. Water is necessary for all life on earth, but too much water can be danger.
23. Water can help men if it is properly controlled.
24. Water from the Colorado River is held-back by HOOVER DAM.
25. LAKE MEAD is the name of the dammed-up water behind the HOOVER DAM.
26. LAKE MEAD is one of the largest man-made bodies of water in all the world.
27. Built inside HOOVER DAM are large TURBINES. (A TURBINE is a machine that can make ELECTRICITY.)
28. Water falling through the blades of the TURBINE make (generate) ELECTRIC power. (This ELECTRIC power is sold to industries and cities in the Southwest part of our country.)
29. SHASTA DAM is located in California on the Sacramento River and is the second-highest concrete dam in the United States. The water which is stored behind the SHASTA DAM is used mainly to IRRIGATE crops.
30. SHASTA DAM not only "controls" the waters of the Sacramento River,it produces ELECTRIC power.
31. Lots of water in California moves in big AQUEDUCTS.
32. An AQUEDUCT is a specially built "channel" or "pipe" that's used to carry water over long distances.
33. Over two thousand years ago, the Romans built and used AQUEDUCTS to move water over many miles of Italy.

LESSON 8 (continued)

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss how rain water soaks into the soil and forms underground pools.
3. Discuss the "water table".
4. Have the class draw a picture illustrating the "water table" or underground pools.
5. Discuss the DIVINING ROD and how it was used to find underground water.
6. Discuss how wells provide the water when city water isn't available.
7. Discuss the effects of EROSION on SOIL.
8. Draw the WATER CYCLE on the chalkboard and explain.
9. Have the children draw a picture of the WATER CYCLE and explain.
10. Discuss how "storing water" is beneficial to man.
11. Draw a picture of HOOVER DAM or SHASTA DAM and discuss.
12. Discuss how ELECTRICITY can be produced from "water power" (TURBINES).

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LESSON 9

"The Need for Clean Water"
"Old Water or New Water"

(Textbook Supplement - pages 130 -- 137)

Purpose:

This lesson presents general information about the need for clean water.

SUMMARY:

Mr. Dee is assisted today by Tom and Carla as they explore the textbook page by page.

KEY WORDS:

WATER
PRECIOUS
POLLUTED
CHEMICALS
FERTILIZERS
DECAYED
MINERALS
ELEMENTS
WATER CYCLE
EVAPORATES
VAPOR
GAS
CONDENSES
PARTICLES
HYDROGEN
OXYGEN
AERATION
HYDROLOGISTS
SUBSTANCE
SURFACE
TREATMENT PLANTS
SEWAGE

MAIN POINTS:

1. WATER is the most common SUBSTANCE on earth.
2. WATER covers more that 70 percent of the earth's SURFACE.
3. Even though the earth's WATER is PRECIOUS . . it is often "wasted" . . or POLLUTED by people.
4. Special WATER TREATMENT PLANTS can make POLLUTED WATER clean and safe again.

5. Sometimes, WATER can be POLLUTED to the point that plants, animals, and even fish can't use it.
6. WATER can become POLLUTED by a factory that's dumping dangerous CHEMICALS into the WATER . . . or maybe some farmer is dumping FERTILIZERS into it . . or maybe a town or city is dumping SEWAGE into the WATER supply.
7. It may take many years to clean up areas that have been badly POLLUTED.
8. Waste products not only can POLLUTE the WATER . . the "fumes" may POLLUTE the air as well.
9. WATER can be made clean by TREATMENT PLANTS where water is sent to "holding tanks" . . . then AERATION blows the WATER into the air.
10. In the "holding tank", heavy materials can settle to the bottom . . . materials like tiny grains of sand, clay or DECAYED plant life that can be carried by moving WATER.
11. AERATION improves the taste and color of the WATER.
12. Some MINERALS that are usually found in water are "lime" . . "iron" . . and "sulfur".
13. "Soft WATER" is WATER that has been treated so that most of the MINERALS have been taken out. (Many families have a "WATER softener" in their homes.)
14. People should not waste WATER.
15. Ever since the world began, WATER has been one of the most important CHEMICALS . . it is necessary for all living things.
16. Some scientists believe the earth was formed from materials that came from the hot sun. These materials included the ELEMENTS that make up WATER.
17. As the earth cooled and grew into a solid mass, WATER was trapped in rocks in the earth's crust. The WATER was slowly released, and the ocean basins filled with WATER. (Other scientists have other ideas about how the earth and WATER began.)
18. The WATER that we drink today has been around ever since the world began. (But the molecules have been remixed.)
19. The WATER CYCLE changes "old" WATER into "new".
20. The actual WATER drops are not the very same. (Each time WATER EVAPORATES into VAPOR it becomes a GAS. The VAPOR mixes with millions and millions of WATER PARTICLES. When the VAPOR cools and CONDENSES, a brand "new" WATER drop is formed. Chances of these millions of PARTICLES forming into the same droplet is very, very unlikely.)
21. In WATER, only the CHEMICALS HYDROGEN and OXYGEN are the same over and over again.
22. HYDROLOGISTS are people who study the WATERS of the earth and the WATERS of the air.
23. HYDROLOGISTS are always experimenting to find ways to easily remove the salt content in the ocean WATER.
24. "Hydro" is a Greek word that means "WATER".

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss with the class ways that WATER can be wasted. (POLLUTED . . . using too much for baths, etc.)
3. Carefully review the WATER purification system on pages 132 - 133.
4. Make a list of ways to "save WATER" . . . both at home and at school. Display this list on the chalkboard or the bulletin board.

LESSON 9 (continued)

5. Review the WATER CYCLE.
6. Discuss the HYDROLOGIST as a career.

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LESSON 10

"The Changing Land"
"Breaking Rocks"
"More About Weathering"

(Textbook Supplement - pages 141 -- 155)

Purpose:

This lesson presents general information about the changing land.

SUMMARY:

Mr. Dee is assisted by Carla as they explore the textbook page by page.

KEY WORDS:

FORCES
WEATHER
TEMPERATURE
CHEMICALS
MOUNTAINS
FUNGUS
DUNES
GEOLOGIST
GLACIER NATIONAL PARK
YOSEMITE NATIONAL PARK
EXPANDS
PRESSURE
ALGA
THE GRAND CANYON
SAND
WEATHERING
MINERALS
ACID
MARBLE
CARBON DIOXIDE
LICHENS
COLORADO RIVER

MAIN POINTS:

1. The earth's surface is constantly being changed by FORCES that are acting on and beneath the earth's surface.
2. Some of these changes to the earth's surface is the constant breaking and wearing-away of rocks into smaller and smaller pieces.
3. FORCES such as WEATHER . . . TEMPERATURE . . . and even CHEMICALS in recent years are wearing-away at the rocks of the earth all the time.
4. MOUNTAINS that have sharp, ragged tops are called "young" MOUNTAINS.
5. After years and years of storms, freezing and thawing TEMPERATURES, the rocks on "young" MOUNTAINS can break apart and wear away. (Old MOUNTAINS do not have the sharp, pointed, jagged peaks or tops . . . but instead are rounded or smoothed off.)
6. A GEOLOGIST is a scientist who studies the earth's crust. (The crust is the part of the earth at or near the surface. It includes the rocks and soil that we can see . . . and a few miles below the earth's surface.)
7. GLACIER NATIONAL PARK is a good place to see part of the Rocky Mountain Chain.
8. The picture of the MOUNTAIN taken at YOSEMITE NATIONAL PARK is wearing away.

LESSON 10 (continued)

9. When rocks are broken into smaller and smaller pieces, it is called WEATHERING.
10. There are several kinds of WEATHERING. (Freezing and thawing water, water pounding, and wind blowing.)
11. Wind also blows particles of sand and wears away the rocks much the same way that "sand paper" would.
12. Many times the roots of trees have grown down into the cracks of rocks . . . seeking out the soil and MINERALS. As these trees grow larger, the roots will EXPAND and the PRESSURE will crack the rocks even more.
13. Cracking rocks, due to growing plants, is another kind of WEATHERING.
14. You wouldn't believe the PRESSURE that can be developed by the roots of shrubs and weeds . . . it doesn't always need to be trees.
15. Some seeds can be carried by the wind and deposited in the rock cracks.
16. Some plants produce weak ACID that also helps to break the rocks apart.
17. Some sidewalks have weeds growing in the cracks . . . this, in time, can help to break apart the cement.
18. Many old gravestones have been worn away by the CHEMICAL, CARBON DIOXIDE in the air and rainwater.
19. MARBLE is any limestone that is hard enough to polish.
20. MARBLE is used for buildings and statues.
21. Limestone is made up mainly of fragments of shells that have been under great PRESSURE and pressed into stone.
22. CARBON DIOXIDE is an odorless, colorless, and tasteless GAS.
23. CARBON DIOXIDE produces a weak ACID when it dissolves in water. (This ACID eats away at stone and MARBLE.)
24. Many famous statues and buildings are in constant danger of being ruined by the WEATHERING effect of CARBON DIOXIDE.
25. LICHENS are flowerless plants that grow on bare rocks and tree stumps.
26. LICHENS may be found all over the world, in hot and cold climates.
27. LICHENS are an ALGA and a FUNGUS that live together in a kind of "plant partnership".
28. The green ALGA makes the food and the FUNGUS part absorbs and store the water.
29. LICHENS have no roots, stems, or leaves . . . and they very often live where no other plants can live.
30 The root-like parts of the LICHENS produce the materials, or ACIDS, that "cut" little grooves into the hard rock. (Over a long period of time, the rock will begin to crumble right where all these little grooves are cut. This doesn't happen rapidly, it depends on weather conditions. In very cold areas near the North or South Pole . . . or high in the MOUNTAINS, it may take thousands of years for the LICHENS to crack the rocks.)
31. Running water is one of the most common ways of WEATHERING.
32. Water in rivers and streams can cut out paths through the tallest MOUNTAINS. (If you've ever been to the GRAND CANYON in northwestern Arizona, you can see just how the COLORADO RIVER has gouged out the CANYON from the surrounding layers of rock.)
33. The GRAND CANYON of the COLORADO RIVER is an outstanding example of the WEATHERING effects of wind, water, and weather on our earth's surface.
34. Wind can do strange and interesting things to SAND.
35. SAND is blown into huge piles called DUNES.
36. Beaches and SAND DUNES are always changing by the force of the wind and water.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Bring pictures of MOUNTAINS to class and have the class identify them as to "young" or "old".
3. Have the children discuss the permanence of rock and speculate whether it can be changed over a period of time naturally. (Leave the answer to this question open at this time.)
4. Draw pictures of "young" and "old" MOUNTAINS.
5. Discuss WEATHERING and how it changes things.
6. Discuss how WEATHERING can change the looks of the land after a long period of time.
7. Draw pictures of plants breaking apart rocks . . . or plants breaking apart a side walk.
8. Discuss how plants that grow in foundations of buildings can cause damage over a long period of time.
9. Discuss how CARBON DIOXIDE is produced.
10. Take a field trip to a local cemetery and find evidence of WEATHERING on the gravestones.
11. Bring in a picture of the GRAND CANYON and discuss how the COLORADO RIVER cut a swath out of the surrounding limestone.
12. Draw pictures of the GRAND CANYON showing the river and the surrounding stone walls of the CANYON.
13. Bring to class pictures of SAND DUNES and discuss how the wind moves great masses of SAND over a long period of time.
14. Have the class compare wind abrasion to abrasion by particles carried by moving water. (Both physically weather rocks)
15. Encourage the children to discuss any trips they may have taken to MOUNTAINOUS areas. (Discuss how MOUNTAINS were formed and how they are presently wearing away.)

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LESSON 11

"Moving Water Changes the Land"
"Building the Land"

(Textbook Supplement - pages 156 -- 166)

Purpose:

This lesson presents general information about the changing land.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

LESSON 11 (continued)

KEY WORDS:

EROSION
SOIL PARTICLES
CURRENT
GRASS
MINERALS
GLACIER
LANDSLIDE
DUST STORM
STRIP MINE
STORMS
COAL
INFRA RED FILM
SATELLITE
MOUTH
CHEMICALS

MAIN POINTS:

1. Moving water changes the land by carrying SOIL PARTICLES and rocks from one place, and putting them in another.
2. EROSION is the "washing away" of the land by fast running water.
3. SOIL that is held together by grass or plant roots, usually has a good chance to resist EROSION.
4. Barren and loose SOIL often is ERODED or carried away by fast-moving water.
5. Fast-moving water often contains bits and pieces of plant and animal life as well as SOIL PARTICLES.
6. EROSION of SOIL and rocks by rivers and streams may take many, many years to ever be noticed.
7. People drink river water only after it has been cleaned and treated with CHEMICALS to make it safe.
8. Wind can cause EROSION by blowing away SOIL PARTICLES.
9. STORMS can cause EROSION with both wind and water.
10. Water EROSION is just one of the "natural things" that must happen to the land around a big body of water. (Lake, Ocean, etc.)
11. People who have built homes near the beach are often concerned about the problem of water EROSION.
12. Sometimes scientists have to be called in to think of ways to keep the STORM-tossed waves from washing away too much of the land. (Still once in a while a house will be washed right down into the water along with the hillside.)
13. A GLACIER is a great river of ice many, many miles long.
14. A GLACIER can stretch from near the top of a high mountain down through the valley below.
15. The movement of a GLACIER is so slow that it is measured in "inches-a-day" rather than "miles-per-hour".
16. If we could see underneath this huge "river of ice", we would be able to see that it is pushing along all the loose SOIL PARTICLES in its path.
17. The slow-moving GLACIER polishes the rocks and scratches them. (Many times, large rocks and boulders are broken apart as they are ground underneath the great weight of the GLACIER.)
18. A LANDSLIDE is an example of "fast" EROSION. (A GLACIER is an example of "slow" EROSION.)
19. A DUST STORM is a high wind that blows over dry land and picks up SOIL PARTICLES. (Many times, there's so much SOIL blowing in the air, you can't see your hand in front of your face.)
20. A DUST STORM can be controlled by growing plants to hold down the SOIL PARTICLES.
21. Some DUST STORMS can carry SOIL PARTICLES for hundreds of miles and last for several days.
22. Loose SOIL PARTICLES can drift like snow sometimes enough to bury the farmer's fences.

LESSON 11 (continued)

23. A DUST STORM can move tons and tons of soil in just a few minutes.
24. STRIP MINING is where the top layers of SOIL have been dug away to allow the miners to reach valuable MINERALS.
25. There is a great deal of STRIP MINING for COAL done in west-central Indiana.
26. INFRA RED FILM is a very special photographic film that let's us see many things that ordinary picture film can't show.
27. With INFRA RED FILM, everything "red" is really "green".
28. Some SATELLITES are equipped with INFRA RED cameras that photograph the earth.
29. The textbook shows a photograph taken by a SATELLITE that shows the MOUTH of the Mississippi River.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss with the class that EROSION is the process of moving the products of weathering from one place to another.
3. Draw pictures of EROSION caused by wind.
4. Draw pictures of EROSION caused by water.
5. Discuss how EROSION can cause damage.
6. Find pictures of EROSION in magazines and display them on the bulletin board.
7. Discuss the characteristics of a GLACIER.
8. Draw pictures of a GLACIER and display them on the bulletin board.
9. Discuss how a GLACIER can change the land underneath it.
10. Discuss how building a dam or planting a wind screen slows down or stops EROSION.
11. Discuss how INFRA RED FILM in cameras sent into the air by SATELLITES can help us learn more about our earth.
12. Discuss how INFRA RED pictures show that SOIL PARTICLES have been carried down the Mississippi River and deposited into the Gulf of Mexico.
13. Discuss how rivers and streams carry loose SOIL PARTICLES along with decayed plant and animal life.

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LESSON 12

"Mountains"
"The Endless Change"

(Text Supplement - pages 167 -- 171)

Purpose:

This lesson presents general information about the changing land.

LESSON 12 (continued)

SUMMARY:

Mr. Dee is assisted by Carla today as they explore the textbook page by page.

KEY WORDS:

CRUST
SURFACE
MOLTEN ROCK
VOLCANIC ERUPTION
LAVA
GRAND TETON MOUNTAINS
GEOLOGIST
PRESSURE
MOUNTAIN
FOSSILS
GLACIER
BOLDERS
TROPICAL SEA
CONTINENTS
FORMATIONS

MAIN POINTS:

1. MOUNTAINS are the highest things in the world.
2. The earth, like a pie, has a CRUST.
3. All the oceans, seas, CONTINENTS, are all found on what we call the earth's CRUST.
4. Sometimes we call the earth's CRUST . . . the earth's SURFACE.
5. The center of the earth is very, very hot . . but we can't feel the heat because the CRUST is too thick.
6. When the earth was forming, the SURFACE cooled first, but deep down, into the center . . . it's still very, very hot. (In fact, it's so hot the rock down there is in a liquid form.)
7. Rock, in a liquid form, is MOLTEN.
8. If this MOLTEN ROCK finds a weakness, or a crack in the earth's SURFACE, it rushes out under great PRESSURE and is then called a VOLCANIC ERUPTION.
9. The PRESSURE from beneath the earth's SURFACE shoots the MOLTEN ROCK high into the air. This very hot, MOLTEN ROCK is called LAVA.
10. When the hot LAVA cools, it turns into hard rock.
11. Many of our MOUNTAINS have been created by VOLCANIC ERUPTIONS.
12. LAVA is many thousands of feet below the earth's SURFACE and there are only certain places on the earth where it can break through.
13. A GEOLOGIST, a scientist who studies MOUNTAINS, takes samples of the earth's CRUST and studies the different rock FORMATIONS.
14. The GRAND TETON MOUNTAINS have been formed by the earth's SURFACE being pushed up from underneath.
15. It takes great PRESSURE to push-up a MOUNTAIN.
16. Ragged MOUNTAINS are "young" . . . while rounded, to smoothed MOUNTAINS are "old".
17. The earth's SURFACE is always changing.
18. "Young" MOUNTAINS have jagged peaks . . . are usually high, and have steep sides.
19. "Old" MOUNTAINS are less steep . . . and are more rounded.
20. Some MOUNTAINS are formed by LAVA . . while others are formed by being pushed-up from underneath.
21. Florence Bascom was one of the first women to be a GEOLOGIST.
22. GEOLOGISTS tell us that this land, where the city of South Bend is standing, was once the bottom of a TROPICAL SEA.
23. Many fish and shell FOSSELS have been found in the rocks.
24. Long after the TROPICAL SEA disappeared, a great GLACIER slid down over all of Canada and parts of the Northern United States.

LESSON 12 (continued)

25. The GLACIER moved slowly . . pushing giant BOLDERS and rocks along its path.
26. The GLACIER covered all of Michigan and most of Northern Indiana.
27. When the GLACIER finally melted, the land was covered with many deep holes . . . which, in time, filled with water and became our lakes.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss the terms SURFACE and CRUST with the class.
3. Describe ways in which MOUNTAINS can be formed on the earth's SURFACE.
4. Explain why the earth's SURFACE is always changing.
5. Draw pictures of a VOLCANIC ERUPTION.
6. Draw pictures of MOUNTAINS being formed by PRESSURES underneath the earth's SURFACE.
7. Discuss the work of GEOLOGISTS.
8. Discuss the importance of finding FOSSILS. (Learning about life in the past . . . learning about the age of the earth . . etc.)
9. Bring a FOSSIL to class and let the class examine it.
10. Discuss the fact that South Bend was once at the bottom of a TROPICAL SEA. (FOSSILS of plant and animal life have been found in the area.)

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LESSON 13

"Stars"
"Distant Stars"
"Our Closest Star"

(Text Supplement - pages 177 -- 186)

Purpose:

This lesson presents general information about the earth and the universe.

SUMMARY:

Mr. Dee is assisted by Mike and Carla as they explore the textbook page by page.

KEY WORDS:

STAR
TELESCOPE
MOON
REFLECTED
PROXIMA CENTAURI
ENERGY
UNIVERSE
LIGHT-YEARS
SUN
MILLION
FILTER
SOLAR FLARE
SPINS
INSTRUMENTS
SUN SPOTS
ATMOSPHERE
GASES
LIGHT
ORBITS
AXIS

LESSON 13 (continued)

MAIN POINTS:

1. We are flying through SPACE . . . and our "craft" is the earth, which ORBITS the SUN at a speed of 67 thousand miles-an-hour.
2. As the earth ORBITS the SUN it SPINS of its AXIS.
3. The SUN is a STAR.
4. As STARS go, the SUN is neither a very big or very bright STAR . . but the SUN is very important to us, here on earth.
5. No living person has ever been to a STAR . . but with the use of our modern INSTRUMENTS scientists are able to learn of burning GASES that give off LIGHT.
6. A TELESCOPE lets us see thousands and thousands of STARS.
7. The more power the TELESCOPE has, the more STARS can be seen.
8. No one really knows for sure just how many STARS there are in the UNIVERSE.
9. The SUN is so close to our earth, it's light is so bright that we can't see the dimmer STARS out in the UNIVERSE (during our daytime).
10. The STARS are always shining out in SPACE.
11. The MOON gets it's light from the SUN that is on the other side of the earth (at night).
12. The MOON shines only by REFLECTED LIGHT.
13. If it wasn't for the MOONLIGHT and the STARLIGHT, the earth would have very dark nights.
14. Since we don't always think of the SUN as a "STAR", the nearest STAR to the earth is called PROXIMA CENTAURI.
15. The STARS are so far out in SPACE that we can't use the earth's measurements of "miles" . . . instead, scientists use a measurement called LIGHT-YEARS.
16. One LIGHT-YEAR is based on the distance LIGHT travels in one earth year. (Scientists know how fast light travels, and a LIGHT-YEAR is the distance that a beam of LIGHT will travel in one year.)
17. PROXIMA CENTAURI is 4.3 LIGHT-YEARS from earth. (That means, it takes 4.3 years for the LIGHT from PROXIMA CENTAURI to reach our earth.)
18. One LIGHT-YEAR would be 5,880,000,000,000 earth miles . . . and PROXIMA CENTAURI, our nearest STAR would be over 4 times that figure.
19. The LIGHT that you see when you look at the STARS in the sky may have been traveling for hundreds of years at the speed of LIGHT is just arriving here on earth the moment you are looking at it.
20. STARS are the biggest things men know of. (The largest STARS would more than fill the SPACE between the earth and the SUN. . . 93 MILLION miles.
21. Scientists tell us that some of the big STARS could be over a thousand times larger than our SUN. (And our SUN is very huge to our earth.)
22. No one really knows just where the UNIVERSE begins or ends.
23. The hottest STARS appear as a blue-white color to us.
24. Red STARS are the coolest.
25. Our SUN is a red STAR.
26. If our SUN were any hotter, the earth would burn up.
27. If our SUN were any cooler, the earth would freeze.
28. A special camera with a FILTER is needed to photograph the SUN.
29. The FILTER helps to cut-down the SUN's brightness.
30. Pictures of the SUN show that it has SOLAR FLARES.
31. A SOLAR FLARE is a great burst of ENERGY that comes from inside the SUN's surface.
32. GASES rising to the SUN's surface in a jet of flame is called a SUN SPOT.

LESSON 13 (continued)

33. Big SUN SPOTS may last for weeks . . . even months. (Small SUN SPOTS may vanish within a day or two.)
34. SOLAR FLARES and SUN SPOTS send great amounts of ENERGY out into SPACE.
35. The earth receives this ENERGY from the SOLAR FLARES and SUN SPOTS and it can cause problems with communications systems sometimes.
36. This ENERGY enters our earth's ATMOSPHERE.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss the fact that STARS are made of hot GASES that produce LIGHT which travels into SPACE in all directions.
3. Discuss with the class the temperature and brightness of different STARS on the basis of their colors.
4. Draw pictures of STARS and display them on the bulletin board.
5. Write the word SPACE on the chalkboard and discuss how a STAR's LIGHT really travels in all directions . . . but only a small amount of it ever reaches the earth.
6. Discuss why we can't see the STAR LIGHT during the daytime.
7. Draw pictures of SOLAR FLARE and display them.
8. Draw pictures of SUN SPOTS and display them.
9. Plan a field trip to the Kennedy Planetarium.
10. Draw pictures of our solar system and display them.
11. Speculate what would happen to our earth if the SUN stopped shining.

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LESSON 14

"Light and Heat from the Sun"
"Star Pictures"

(Text Supplement - pages 187 -- 201)

Purpose:

This lesson presents general information about the earth and the universe.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

LESSON 14 (continued)

KEY WORDS:

BILLIONS
UNIVERSE
SUN
SUNLIGHT
LIGHT
BIG DIPPER
LITTLE DIPPER
ENERGY
WATER CYCLE
WEATHER
WORSHIPPED
SUN DIALS
SOLAR SYSTEM
STARS
SOLAR ENERGY
SOLAR CELLS
SPACECRAFTS
BATTERIES
ELECTRICITY
CONSTELLATIONS
MILKY WAY
MILLIONS
STAR PICTURES
LEO
CASSIOPEIA
URSA MAJOR
TIME EXPOSURE
NORTH STAR
POLESTAR
EVAPORATING

MAIN POINTS:

1. The SUN is a huge, flowing ball of gases at the center of our SOLAR SYSTEM.
2. The SUN is more important to people than any other object in the sky, though it is only one of BILLIONS of STARS in the UNIVERSE.
3. The SUN warms our earth and gives us LIGHT.
4. All life on the earth . . . people, animals, and plants . . . depends on the SUN's ENERGY.
5. Just imagine what kind of an earth we would have without the SUNLIGHT.
6. The SUN will be providing LIGHT and ENERGY to our earth for MILLIONS and MILLIONS of years.
7. The SUN is constantly EVAPORATING the water from lakes and rivers.
8. EVAPORATED water is going up into the air to form clouds.
9. Without the SUN, there would be no WEATHER . . . and no WATER CYCLE.
10. Some of the early people in the world actually WORSHIPPED the SUN. (They thought the SUN was important enough to make it a god.)
11. Years ago, people used the SUN to tell time . . . they made SUN DIALS.
13. Some modern homes can be heated (and cooled) by SOLAR ENERGY.
14. The ENERGY from the SUN shines on SOLAR CELLS to generate ELECTRICITY.
15. SPACECRAFTS use SOLAR CELLS to keep their BATTERIES charged with ELECTRICITY.
16. Scientists are working all the time to find new ways that we can use the ENERGY from the SUN. (It is important that scientists speed up the research to make the SUN's ENERGY possible for more people to use at a reasonable cost.)
17. Some people make STAR PICTURES when they look at the STARS in the night sky.
18. Groups of STARS that seem to form STAR PICTURES are called CONSTELLATIONS.
19. By knowing the positions of the CONSTELLATIONS, it is possible to locate other STARS, PLANETS, and COMETS.
20. For thousands of years, people have used their knowledge of the CONSTELLATIONS to guide them from place to place during their travels over the surface of the earth.
21. Many of the CONSTELLATIONS have Latin names because Latin was the language of "educated" people long ago.
22. Two of the better known CONSTELLATIONS are the BIG DIPPER and the LITTLE DIPPER.
23. Another CONSTELLATION is URSA MAJOR . . or what we call the "Big Bear".
24. The CONSTELLATION of CASSIOPEIA means the "queen".

LESSON 14 (continued)

25. Pictures taken of STARS show their movements.
26. A picture taken with the lense of the camera open is called a "TIME EXPOSURE".
27. One of the important STARS is the NORTH STAR . . . or, sometimes called the "POLESTAR".
28. The NORTH STAR shines over the North Pole of the earth.
29. The NORTH STAR, or POLESTAR is the very last STAR in the handle of the LITTLE DIPPER.
30. The earth, and all the rest of the SOLAR SYSTEM belongs to the MILKY WAY.
31. The MILKY WAY system is a giant group of STARS, PLANETS, and moons that are clustered in space.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss the fact that the SUN's ENERGY can be used to tell time, heat homes, and power satellites.
3. Draw pictures showing the SUN's ENERGY working for man.
4. Find pictures of CONSTELLATIONS in books, magazines, or newspapers and display these on the bulletin board.
5. Discuss how the NORTH STAR was helpful to world travelers. (It was a bright STAR . . . remained constant . . . and could be found in the handle of the LITTLE DIPPER . . . or from the "pointer" STAR of the BIG DIPPER.)
6. Have the children find out more stories that people who lived long ago made up about STARS and CONSTELLATIONS.
7. Draw pictures showing the BIG DIPPER . . LITTLE DIPPER . . NORTH STAR . . and display them on the bulletin board.

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LESSON 15

"New Sights In Space"

(Text Supplement - pages 202 -- 205)

Purpose:

This lesson presents general information about the earth and the universe.

SUMMARY:

Mr. Dee is assisted by Tom, Carla, and Mr. Dan Smith of the Kennedy School Planetarium, as they explore the text book page by page.

KEY WORDS:

OPTICAL
TELESCOPE
STARS
OBSERVATORIES
REFRACTORS
SUN
LENSES

PLANETS
REFLECTORS
HALE TELESCOPE
YERKES OBSERVATORY
ASTRONOMERS
NEBULA
BILLIONS

CONSTELLATIONS
VIDEO SCREEN
EYEPIECE
SATELLITE
ATMOSPHERE
MONITOR
SMOG
MT. WILSON OBSERVATORY

MAIN POINTS:

1. TELESCOPES makes STARS look closer and brighter.
2. TELESCOPES that look out into space can be found in OBSERVATORIES.
3. OBSERVATORIES use two kinds of OPTICAL TELESCOPES.
4. A REFRACTOR TELESCOPE focuses light rays with a system of LENSES.
5. A REFLECTOR TELESCOPE focuses light rays with a curved mirror.
6. The HALE TELESCOPE is on top of a mountain in California.
7. The HALE TELESCOPE is the world's largest REFLECTING TELESCOPE.
8. The HALE TELESCOPE uses a mirror that measures 200 inches, or nearly 5 meters in diameter. (The HALE TELESCOPE is the world's largest REFLECTOR TELESCOPE.)
9. The world's largest REFRACTOR TELESCOPE is at YERKES OBSERVATORY at Williams Bay, Wisconsin.
10. A TELESCOPE of 100 inch diameter may cost several million dollars.
11. Most ASTRONOMERS use the TELESCOPES at night because the brightness of the SUN makes the daytime viewing very difficult.
12. ASTRONOMERS begin their work when most other people are getting ready for bed.
13. At OBSERVATORIES, the big domes are opened and turned to allow the light of the selected STAR to reach the LENS or mirror of the TELESCOPE.
14. The TELESCOPE is slowly moved into viewing position by big electric motors.
15. The "observer" stands on a high platform which can be raised or lowered until he can reach the "EYEPIECE" or "photographic plateholder" of the TELESCOPE.
16. When faint STARS are to be photographed, the ASTRONOMER sets the camera in the TELESCOPE so that the LENS will stay opened for a long time. (This is called a "time exposure".)
17. Some STAR pictures have been made where the camera LENS was opened for several hours. (It all depends upon how much light the STAR is sending.)
18. In the pictures, the PLANETS will appear to be "blurry" as they are moving.
19. TELESCOPES let ASTRONOMERS see stars from BILLIONS of miles away.
20. TELESCOPES are probably the most important things that ASTRONOMERS use when they study the heavens.
21. Some "observers" MONITOR STARS on a VIDEO SCREEN.
22. Some TELESCOPES are better because they don't have to look through the earth's dirty ATMOSPHERE.
24. When MT. WILSON OBSERVATORY was built years ago, it was put on the top of a high mountain near the city of Los Angeles, California.
25. Today, Los Angeles has become a very large city . . . and the fumes from the cars and factories have "polluted" the air so that the MT. WILSON OBSERVATORY ASTRONOMERS have a difficult time seeing through the SMOG.

26. SMOG is a combination of smoke and fog.
27. A NEBULA is a huge cloud of gas in space.
28. Some NEBULAS glow brightly and give off light because of near-by STARS.
29. NEBULA (NABULAE) is a term that comes from the Latin Language. (It means "clouds" in Latin.)
30. A "glowing" NEBULA can easily be seen through a powerful TELESCOPE.
31. A "dark" NEBULA may blot-out part of the Milky Way. . . . and be visible only as dark shapes.
32. STARS are made of hot gases that give off light.
33. The SUN is our closest STAR.
34. The SUN is a medium-sized, yellow STAR.
35. CONSTELLATIONS are groups of STARS that seem to make "shapes" we know.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss a TELESCOPE with the children. Ask if anyone has ever looked through a TELESCOPE.
3. Draw pictures of an OBSERVATORY using a TELESCOPE and display them on the bulletin board.
4. Draw pictures of STARS, PLANETS, or CONSTELLATIONS that might be seen through a powerful TELESCOPE and display them on the bulletin board.
5. Find pictures in books or magazines of STARS, PLANETS, or CONSTELLATIONS and display them on the bulletin board.
6. Discuss Galileo and learn what contributions he made to the field of ASTRONOMY.

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LESSON 16

"Machines at Work"
"Lifting Things"
"Other Levers"

(Text Supplement - pages 208 -- 217)

Purpose:

This lesson presents general information about machines at work.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

LESSON 16 (continued)

KEY WORDS:

MACHINE
FACTORIES
OFFICES
TOOLS
SIMPLE MACHINES
LEVERS
FULCRUM
FORCE ARM
LOAD ARM
DOUBLE LEVERS
FORCE

MAIN POINTS:

1. A MACHINE is an object that does work.
2. FACTORIES use MACHINES to make the many products that we need.
3. OFFICES use MACHINES to type letters and handle business matters.
4. Man has made many MACHINES to satisfy his needs.
5. TOOLS are MACHINES that help people do things better or easier.
6. TOOLS are called SIMPLE MACHINES because they usually do "simple" tasks.
7. A LEVER is a SIMPLE MACHINE that has many uses.
8. All LEVERS have three parts : a FULCRUM . . . a FORCE ARM . . and a LOAD ARM.
9. The LOAD ARM is the distance from the FULCRUM to the "load". (The "load" is the thing that you want to move.)
10. A person who presses down on the LEVER is the FORCE.
11. A screwdriver can be used as a LEVER.
12. A claw-hammer can be used as a LEVER to pull out nails from a board.
13. Not all LEVERS are straight. (The claws of the hammer are curved.)
14. The distance from the handle to the hammer-end is the FORCE ARM. The flat-end of the hammer is used as the FULCRUM. . . and the tip of the hammer-head to the claw is called the LOAD ARM. (The nail is the LOAD.)
15. The hammer is a SIMPLE MACHINE that not only lets you drive a nail into a piece of wood . . the LEVER lets you remove that nail if you need to.
16. The FORCE ARM of a screwdriver is used as a LEVER. (The FULCRUM is the edge or "rim" of the paint can itself. The LOAD ARM is the space between the FULCRUM and the end of the screwdriver. This is a LEVER that "lifts".)
17. DOUBLE LEVERS do certain kinds of jobs.
18. Pliers are DOUBLE LEVERS that can pinch things together and let you hold on to something with more FORCE than with just your bare hands.
19. Scissors are DOUBLE LEVERS where two blades work together cutting through paper, cloth, and thin metal.
20. A fishing pole is a LEVER. (When the fish bites on the hook, the girl has only to move her hand a little bit and the end of the LEVER moves much more. The quick movement of the LEVER also makes the hook move faster.)

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss what a SIMPLE MACHINE is supposed to do. (Simple tasks)
3. Draw the parts of a LEVER on the chalkboard and explain what the function of each is for.
4. Discuss how LEVERS can be found in everyday life. (Hammers, scissors, pliers, screwdrivers . . . etc.)

5. Have the children draw pictures of LEVERS and display them on the bulletin board.

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LESSON 17

"Wheels With Teeth"
"Ramps"
"Splitting Things"

(Text Supplement - pages 218 -- 233)

Purpose:

This lesson presents general information about machines at work.

SUMMARY:

Mr. Dee is assisted by Carla as they explore the textbook page by page.

KEY WORDS:

GEARS
TRANSFER
ROTATING
MOTION
POWER
NOTCHES
DISTANCE
RAMP
SIMPLE MACHINES
INCLINED PLANES
WEDGE
BURROW
WEDGE-SHAPED
WHEELS
SLANTING SURFACES

MAIN POINTS:

1. GEARS are round WHEELS with "teeth", or NOTCHES cut into them.
2. GEARS are used to TRANSFER ROTATING MOTION and POWER from one part of a machine to another.
3. An egg beater is a SIMPLE MACHINE that uses GEARS to do the work.
4. An egg beater has large GEARS and small GEARS.
5. A hand drill has large GEARS and small GEARS.
6. A bicycle is a good example of GEARS and WHEELS working together.
7. WHEELS that have NOTCHES or "teeth" are called GEARS.
8. On a 10 speed bicycle, each speed has a GEAR of a different size.
9. A bicycle is a SIMPLE MACHINE.
10. A bicycle lets you travel a greater DISTANCE than you can on foot.
11. RAMPS are SLANTING SURFACES that let you go from one level to another.
12. RAMPS are sometimes called INCLINED PLANES.
13. RAMPS are handy SIMPLE MACHINES.
14. Parking garages lets automobiles drive up RAMPS from one level to another.
15. Instead of stairsteps, RAMPS are used to let people walk from one level to another.

LESSON 17 (continued)

16. A WEDGE is a SIMPLE MACHINE with a sharp edge on one side and a thicker edge on the other.
17. A WEDGE is often used to "cut" or "split" things.
18. Some birds and animals have "body-parts" that help them to take care of themselves.
19. The nose of the mole is used to BURROW through the soil . . . and the woodpecker's WEDGE-SHAPED beak is used to pick holes in tough tree bark in search for food.
20. Many young plants have WEDGE-SHAPED leaf tips that make it easier for the leaves to push through the soil.
21. Some objects have WEDGE-SHAPED ends. (Nails pierce wood pieces and hold them together, needles carry threads through cloth, and pins pierce and hold objects together.)

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss how GEARS are used to help man.
3. Draw some GEARS on the chalkboard and discuss them with the class.
4. Bring some SIMPLE MACHINES that use GEARS to class and demonstrate.
5. Discuss how RAMPS (INCLINED PLANES) are used to help man.
6. Draw some RAMPS on the chalkboard and discuss them with the class.
7. Find pictures in magazines of GEARS, RAMPS, amd WEDGES and display them on the bulletin board.
8. Discuss how some plants and animals have "body-parts" designed like WEDGES.
9. Discuss how a WEDGE is used to help man.
10. Have the children draw pictures of WEDGES . . . RAMPS . . . and GEARS. (Have them invent a SIMPLE MACHINE that uses these objects and tell what their MACHINE will do to help man.)

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LESSON 18

"Using Electricity"
"Electric Current"
"Electric Current into Light and Heat"

(Text Supplement - pages 236 -- 244)

Purpose:

This lesson presents general information about using electricity.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

LESSON 18 (continued)

KEY WORDS:

ELECTRICITY
ELECTRIC CURRENT
BATTERY
POWER PLANT
TRANSMISSION LINES
TOWERS
NUMBER CELLS
SILVER
CONDUCTOR
COPPER
CALCULATOR
ALUMINUM
CIRCUIT
HEAT
LIGHT
PLUGS
SOCKETS
APPLIANCES
TERMINALS
DRY CELL BATTERY
LIGHT HOUSE
LENSE
OXYGEN

MAIN POINTS:

1. ELECTRICITY does more work for us than anything else you can think of.
2. CURRENT ELECTRICITY is the kind that works for us.
3. CURRENT ELECTRICITY may come from a flashlight BATTERY or from a huge POWER PLANT.
4. CURRENT ELECTRICITY comes from POWER PLANTS to cities and villages many miles away.
5. CURRENT ELECTRICITY comes through "wires" called TRANSMISSION LINES.
6. TRANSMISSION LINES are usually high in the air on tall steel TOWERS that cross hills, highways, and valleys.
7. ELECTRICITY will travel through almost any kind of metal wire.
8. Anything that carries ELECTRICITY easily is called a CONDUCTOR.
9. SILVER is one of the best CONDUCTORS. (SILVER is too expensive to use.)
10. COPPER is an excellent CONDUCTOR and is much cheaper that SILVER.
11. Sometimes, less expensive ALUMINUM is used as a CONDUCTOR.
12. ELECTRICITY flows in an electrical CIRCUIT.
13. ELECTRIC CURRENT can produce LIGHT and HEAT.
14. Many electrical APPLIANCES can produce LIGHT and HEAT.
15. A DRY CELL BATTERY can store ELECTRICITY.
16. Wires attached to the TERMINALS of a DRY CELL BATTERY can carry ELECTRIC CURRENT.
17. Homes are wired for ELECTRICITY and APPLIANCES are simply operated by PLUGS in the walls.
18. A LIGHT HOUSE shines a bright beam of LIGHT out over the dark water.
19. The LIGHT HOUSE has a big "lamp" or "lantern" that is a big LENSE, shaped somewhat like a "barrel". This LENSE may be 8 feet high . . and 6 feet around.
20. Sailors and ship captains know where all these LIGHT HOUSES are on their travel maps.
21. LIGHT HOUSES protect ships from striking rocks or shallow places at night or during fog.
22. Light bulbs have the air taken out of them. (Fire must have OXYGEN found in the air in order to burn.)
23. Light bulbs have wire with ELECTRICITY that get very hot. Since the bulbs have no OXYGEN the wires glows white hot . . . this produces white LIGHT.
24. All light bulbs will eventually "burn out" usually after many hours of use.
25. Small CALCULATORS use ELECTRICITY to make them work.
26. CALCULATORS use ELECTRICITY stored in BATTERIES.
27. Small wires in the CALCULATOR'S NUMBER CELLS glow when a small ELECTRIC CURRENT is sent through them.

28. CURRENT ELECTRICITY found in the PLUGS and SOCKETS at school and in your home is very strong and should never be used by a 3rd grader to experiment with. If you do you may very possibly kill yourself of destroy your home . . . or even both. So leave CURRENT ELECTRICITY alone. Never experiment by putting anything in a PLUG or SOCKET.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss with the class how ELECTRICITY improves our way of living. (It helps run machines, gives LIGHT and HEAT, etc.)
3. Bring some BATTERIES to class and let the children examine them.
4. Discuss how ELECTRICITY can be "stored-up" inside a BATTERY.
5. Discuss how BATTERY ELECTRICITY (DC) is different from CURRENT ELECTRICITY (AC).
6. Do some simple experiments (from the text) to illustrate the presence of ELECTRICITY.
7. Make a list on the chalkboard of the many household APPLIANCES that work with ELECTRICITY.
8. Discuss how ELECTRICITY can help in industry and in hospitals.
9. Discuss the purpose of a LIGHT HOUSE.
10. Have the class draw pictures of a LIGHT HOUSE with its LIGHT beam shining out over the water.
11. Discuss the kind of light ("lamp") a LIGHT HOUSE would need.
12. Discuss how ELECTRIC signs can help you. (Advertising . . . . warnings . . . . and information)
13. Discuss how ELECTRIC CALCULATORS can help you. (Getting quick and accurate answers to problems)
14. Discuss how we need to conserve ELECTRICITY.
15. Discuss how various kinds of ELECTRICITY is produced. (Dams . . . fire and steam furnaces, etc.)

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LESSON 19

"Electric Current Moves Objects"
"Electricity at Work"

(Test Supplement - pages 245 -- 250)

Purpose:

This lesson presents general information about using electricity.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

LESSON 19 (continued)

KEY WORDS:

ELECTRICITY
APPLIANCES
MOTOR
IRON NAIL
DRY CELL BATTERY
ELECTRIC CURRENT
ELECTROMAGNETS
MAGNETISM
TRANSFORMER
LATHE
MAGNET
ELECTRICAL FORCES
METER
ENERGY
LIGHTNING
REDUCES

MAIN POINTS:

1. ELECTRICITY is one of the most useful kinds of ENERGY.
2. Even before there was life on earth there was ELECTRICITY.
3. LIGHTNING is ELECTRICITY.
4. ELECTRIC CURRENT moves through objects.
5. APPLIANCES must have ELECTRICITY in order for them to do their job.
6. ELECTRICAL APPLIANCES have a MOTOR that makes it work.
7. An IRON NAIL with a wire wrapped around it many times can be used as an ELECTROMAGNET.
8. ELECTRICITY from a DRY CELL BATTERY will flow through the wires and give MAGNETISM to the IRON NAIL.
9. The IRON NAIL can produce an ELECTRIC CURRENT.
10. Many APPLIANCES use an ELECTROMAGNET of some kind to make them work.
11. A TRANSFORMER takes the ELECTRICITY that comes to your house and REDUCES it sending only a small portion to an ELECTRIC MOTOR.
12. A LATHE is a woodworking machine that is run by an ELECTRIC MOTOR.
13. ELECTROMAGNETS can be used to sort out iron and steel from trash so that those metals can be used over again.
14. A MAGNET uses ELECTRICAL FORCES that are called MAGNETISM.
15. ELECTROMAGNETS have MAGNETISM only when an ELECTRIC CURRENT flows through the wires that have been wrapped around the IRON PIECE.
16. An ELECTRIC METER shows how much ELECTRICITY is being used.
17. The ELECTRIC Company uses a METER to know how much to charge its customers.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss the fact that ELECTRICITY can produce movement in objects by use of an ELECTROMAGNET.
3. Make a simple ELECTROMAGNET and demonstrate for the class.
4. Discuss the use of MAGNETS. (Natural . . . and ELECTROMAGNETS)
5. Discuss how MAGNETS and ELECTROMAGNETS can be used to separate iron and steel from non-MAGNETIC materials (Junk yard . . etc.).
6. Discuss how ELECTRICITY is used to make the APPLIANCES pictured in the textbook do helpful work for man.

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LESSON 20

"Saving Electrical Energy"
"The Safe Thing To Do"

(Text Supplement - pages 251 -- 257)

Purpose:

This lesson presents general information about using electricity.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

KEY WORDS:

ELECTRICITY
ELECTRICAL ENERGY
ENERGY SOURCES
FUEL
INSULATION
METAL
WATER
CONDUCTOR
ALUMINUM
SHOCK
PLUG
SOCKET
ELECTRICAL APPLIANCE
ENERGY
POWER PLANTS

MAIN POINTS:

1. Some kinds of ENERGY comes from ELECTRICITY.
2. ELECTRICAL ENERGY is easy to use when it comes to making things work.
3. Some ELECTRICITY comes from large POWER PLANTS.
4. Long ago people used other kinds of ENERGY SOURCES.
5. They used oil lamps for light, wood and coal for heat, light, and cooking purposes.
6. Many homes today have fireplaces, but long ago, fireplaces were the only source for heat, cooking, and a portion of light.
7. It takes FUEL to make ELECTRICITY, and FUEL is getting scarce.
8. Many people put INSULATION in their homes to keep our the heat and cold.
9. INSULATION can help save ELECTRICITY by keeping the outside air from coming in.
10. Everyone should save ELECTRICAL ENERGY.
11. Lights, radios, and ELECTRICAL APPLIANCES should always be turned off when they're not being used.
12. METAL and WATER are good CONDUCTORS of ELECTRICITY.
13. ALUMINUM is a CONDUCTOR of ELECTRICITY. (Never touch an ELECTRIC wire with an ALUMINUM ladder.)
14. Touching an ELECTRIC wire can give you a SHOCK.
15. Never use ELECTRIC tools or ELECTRICAL APPLIANCES near WATER.
16. Never turn on an ELECTRIC tool with wet hands or when standing on a wet floor.
17. You should always hold on to the PLUG and not the cord of an ELECTRIC wire when you pull it out of the wall SOCKET.

LESSON 20 (continued)

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss how ELECTRICAL ENERGY can be produced by burning FUELS such as coal . . oil . . and natural gas.
3. Discuss saving ELECTRICAL ENERGY at home and at school.
4. Make a list of things in your classroom that use ELECTRICAL ENERGY.
5. Make a list of things in homes that use ELECTRICAL ENERGY.
6. Discuss the "safety rules" on page 255.
7. Bring an electrical cord to class and demonstrate the correct way to PLUG and un-PLUG it into the wall SOCKET.

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LESSON 21

"What Do We Eat?"
"Sugars"
"Starches"
"Fats"

(Text Supplement - pages 260 -- 269)

Purpose:

This lesson presents general information about the foods we eat.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

KEY WORDS:

OIL
FOOD
PLANTS
ANIMALS
ENERGY
SUGARS
BUTTER FAT
SWEETENER
CARBOHYDRATE
WHITE SUGAR
REFINED SUGAR
VITAMINS
SUGAR CANE
TES-TAPE
STARCH
SUBSTANCE
CELLS
NUTRIENT
SUGAR BEETS
IODINE
IODINE SOLUTION
FATS
ABSORBANT PAPER
DIET

MAIN POINTS:

1. FOOD is something every living thing needs.
2. FOOD gives living things ENERGY.
3. FOOD provides ENERGY for our nerves . . . muscles . . . heart . . and glands.

LESSON 21 (continued)

4. FOOD comes from both PLANTS and ANIMALS.
5. Each person should be very careful of the amount of SUGAR he eats. (We really need very little SUGAR in our DIETS, and an excess can affect our health in many ways.)
6. SUGAR is a tasty SUBSTANCE that is widely used as a SWEETENER. (Many people use SUGAR to improve the "flavor" of many kinds of FOOD.)
7. All green PLANTS make their own SUGAR . . but most of the SUGAR used for SWEETENING comes from SUGAR CANE and SUGAR BEETS.
8. SUGAR is a CARBOHYDRATE but it contains no VITAMINS.
9. Two basic kinds of SUGAR are WHITE SUGAR and REFINED SUGAR.
10. The human body needs certain VITAMINS to break-down the CARBOHYDRATES into ENERGY. (So, other FOODS must supply the necessary VITAMINS that SUGAR lacks.)
11. One way to test for SUGAR in foods is by using TES-TAPE.
12. STARCH is a white, powdery SUBSTANCE found in the living CELLS of green PLANTS.
13. STARCH is a NUTRIENT.
14. Some of the SUGAR in PLANTS is changed into STARCH in your body and stored for ENERGY.
15. An IODINE SOLUTION is used to "test" for STARCH in FOODS.
16. IODINE is poisonous.
17. FAT also gives our body ENERGY.
18. Many of the foods you eat contain FAT.
19. Milk contains BUTTER FAT.
20. Peanuts and peanut butter contain OIL.
21. FAT is a NUTRIENT that supplies much ENERGY to our bodies.
22. FAT can be tested on ABSORBANT PAPER.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Discuss that all FOOD comes from PLANTS and ANIMALS.
3. Ask the children what they ate for breakfast (lunch, supper, etc.).
4. Obtain one roll of TES-TAPE (a chemically treated paper that shows a color change in the presence of glucose SUGAR) at a pharmacy and small paper cups of fruit juices. (Avoid fruit "drinks") Perform the experiment on page 264.
5. Bring some SUGAR FOODS to class and let the children examine them.
6. Bring some STARCH FOODS to class and let the children examine them.
7. Bring some FAT FOODS to class and let the children examine them.
8. Do the STARCH experiment on pages 266 - 267.
9. Do the FAT experiment on page 269.
10. Have the children draw pictures of FOODS with SUGAR . . . STARCH . . and FATS.

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LESSON 22

"Proteins"
"Minerals and Vitamins"
"A Diet"

LESSON 22 (continued)

(Text Supplement - pages 270 -- 281)

Purpose:

This lesson presents general information about the foods we eat.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

KEY WORDS:

PROTEINS
CARBON
HYDROGEN
NITROGEN
OXYGEN
IRON
PHOSPHORUS
SULFUR
AMINO ACIDS
CELLS
GROWTH
REPAIR
MINERALS
VITAMINS
HEALTH
VITAMIN A
B COMPLEX
VITAMIN C
NUTRIENTS
VITAMIN D
VITAMIN E
VITAMIN K
BLOOD CLOTTING
DIET
BALANCED DIET
FOODS

MEAT AND FISH GROUP
BREAD AND CEREAL GROUP
VEGETABLE AND FRUIT GROUP
MILK GROUP

MAIN POINTS:

1. PROTEIN is one of the three important FOODS your body needs to grow and keep HEALTHY.
2. PROTEINS can be found in every CELL and are needed in plant and animal life.
3. All PROTEINS contain CARBON . . HYDROGEN . . NITROGEN . . and OXYGEN. (Some PROTEINS also contain IRON . . PHOSPHORUS . . and SULFUR.)
4. Scientists tell us that PROTEINS are very complicated and are made-up of smaller "units" called AMINO ACIDS.
5. You can use your sense of "smell" to detect PROTEIN in FOODS.
6. Feathers have lots of PROTEIN in them. (Once you smell burning feathers or even burning hair, you'll never forget it.)
7. All living things are made-up of what we call CELLS.
8. CELLS will die if they don't have PROTEIN. (CELLS are found in all body parts including: blood, skin, bone, muscle, and hair.)
9. PROTEINS are found in FOODS that come from both plants and animals.
10. PROTEINS are used mainly for GROWTH and REPAIR. (While sugars, starches, and fats are used for "energy".)
11. Your body needs MINERALS and VITAMINS for growth and body control.
12. MINERALS and VITAMINS can be found in FOODS that come from both plants and animals.
13. Like the PROTEINS, MINERALS and VITAMINS do not provide "energy", but they are important for your body's HEALTH.
14. VITAMIN A is necessary for your body's growth and is needed for healthy skin and good vision.

15. B COMPLEX was first believed to be only one VITAMIN . . but scientists now tell us that B COMPLEX contains at least eight VITAMINS.
16. B COMPLEX helps to change FOODS into "energy".
17. VITAMIN C is needed for healthy blood vessels, bones, and teeth. (People who lack VITAMIN C may have sore gums and suffer bleeding under the skin.)
18. VITAMIN D helps prevent a disease called "rickets". (Rickets affect the bones in the body.)
19. VITAMIN D is often called the "sunshine" VITAMIN" because it forms in the skin when the body gets sunlight.
20. VITAMIN E is important for breaking-up "fatty acids" in your blood.
21. VITAMIN K is very important for "blood clotting". (If your blood didn't "clot", you could possibly bleed to death from a cut or other injury.)
22. A DIET is the food and drink you take day after day.
23. Eating a BALANCED DIET means that you are to eat foods that will give you the proper amount of all the NUTRIENTS . . . sugars, fats, starches, PROTEINS, VITAMINS, and MINERALS.
24. A lot of "body-building" PROTEIN is found in the MEAT AND FISH GROUP.
25. The VEGETABLE AND FRUIT GROUP provides lots of VITAMINS and MINERALS.
26. The BREAD AND CEREAL GROUP provides lots of starches for "energy".
27. The MILK GROUP provides PROTEINS . . . fats . . . sugars . . and some VITAMINS and MINERALS.
28. "Snack-type" FOODS are high in sugar content, but low in VITAMINS, MINERALS, and PROTEIN.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Write the word PROTEIN on the chalkboard and help the children pronounce it.
3. Remind the children that body tissues are partially made from PROTEIN and ask them to help you list some body parts that contain PROTEIN.
4. Write the words VITAMINS and MINERALS on the chalkboard and help the children pronounce them.
5. Write the words "iron" . . . "calcium" . . . and "phosphorous" on the chalkboard and point out that these are all important MINERALS.
6. Find pictures in magazines of FOODS and make composite pictures illustrating the 4 basic FOOD groups. (Display these pictures on the bulletin board.)
7. Have a FOOD "tasting" party and introduce a BALANCED DIET using some FOODS from each of the 4 basic FOOD GROUPS.
8. Bring in some "junk" or "snack" FOODS and discuss the non-nutritional value of these items.

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LESSON 23

"How We Use What We Eat"
"Where Digestion Begins: The Teeth"
"More Digestion in the Mouth"

LESSON 23 (continued)

(Text Supplement - pages 284 -- 292)

Purpose:

This lesson presents general information about how we use what we eat.

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

KEY WORDS:

DIGESTION
MOLECULES
DIGESTED PARTICLES
INTESTINAL WALL
BLOOD STREAM
NOURISH
BLOOD VESSELS
DIGEST
ENERGY
FOOD
TEETH
TONGUE
ENAMEL
ROOT CANAL
MINERAL
ROOTS
JAW
DECIDUOUS TEETH
PERMANENT TEETH
GUMS
CROWN
INCISORS
TOOTH
NERVES
THROAT
SALIVA
GLANDS
SALIVARY GLANDS
STARCH
SUGAR
STOMACH

MAIN POINTS:

1. DIGESTION is when FOOD is broken-down into small PARTICLES or MOLECULES.
2. Breaking-down FOOD makes it possible for the smaller DIGESTED PARTICLES to pass through the INTESTINAL WALL into the BLOOD STREAM.
3. These simple DIGESTED PARTICLES of FOOD in the BLOOD STREAM are sent to NOURISH all parts of the body.
4. ENERGY comes from the FOOD that you eat.
5. In order to get FOOD into the STOMACH, your TEETH, TONGUE, and lips must work together to "chop" and "crush" the FOOD PARTICLES into smaller and smaller pieces.
6. The TEETH do the "cutting" and "tearing".
7. A TOOTH is made of a very hard MINERAL called ENAMEL.
8. The living part of a TOOTH is in the ROOT CANAL.
9. The ROOT CANAL contains the BLOOD VESSELS and the NERVES.
10. Each TOOTH fits into the bone in your JAW.
11. Humans normally have two sets of TEETH.
12. The first set is called DECIDUOUS TEETH . . or "baby TEETH". (DECIDUOUS means to "fall off".)
13. The second set is called PERMANENT TEETH.
14. There are 32 PERMANENT TEETH.
15. DECIDUOUS TEETH help the PERMANENT TEETH push through the GUMS into their normal positions. (Most of the PERMANENT TEETH form near the ROOTS of the DECIDUOUS TEETH.)
16. When a child is about 3 years old, the ROOTS of the DECIDUOUS TEETH begin to slowly dissolve.
17. The top of a TOOTH is called a CROWN.
18. Near the front of the mouth are INCISORS that "cut" and "tear" the FOOD.

19. Farther back in the mouth are TEETH that "crush" and "grind" FOOD.
20. Chewing FOOD is the first step in DIGESTION.
21. Under-chewed FOOD is hard to DIGEST and sometimes could cause a STOMACH ache.
22. The TONGUE muscles run in many different directions making the TONGUE able to move in many different directions.
23. The TONGUE moves the FOOD around in the mouth, pushing it between the TEETH . . . rolling it into small masses . . and pushing it back into the THROAT.
24. SALIVA is a sticky fluid that is produced in the mouth which contains a chemical that helps break-down or dissolve FOOD.
25. SALIVA moistens and softens all FOOD that is taken into the mouth.
26. SALIVA is produced by three pairs of SALIVARY GLANDS.
27. One pair of SALIVARY GLANDS is located in front of the ears . . and another pair is under the lower JAW. The third pair of GLANDS is found under the TONGUE.
28. The thought of FOOD, or the smell of FOOD starts the SALIVARY GLAND working and that prepares your mouth for the FOOD that's coming.
29. SALIVA can change STARCH to SUGAR in your mouth.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. State that FOOD must be changed before it can be used.
3. Review the functions of the TEETH in getting food ready for DIGESTION. (Also discuss the functions of the TONGUE, lips, and SALIVA.)
4. Review the drawing on page 290 and discuss in detail.
5. Discuss how the chemicals in SALIVA can change STARCH into SUGAR.
6. Have the children draw a picture similar to the one on page 290.
7. Find pictures in magazines of people eating FOOD and put them on the bulletin board.
8. Discuss the cause of a STOMACH ache. (Chewing too fast and not long enough)

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LESSON 24

"The Food Tube and Stomach"
"The Small Intestine"
"The Large Intestine"

(Text Supplement - pages 293 -- 303)

Purpose:

This lesson is the last in the series and presents general information about how we use what we eat.

LESSON 24 (continued)

SUMMARY:

Mr. Dee is assisted by Tom and Carla as they explore the textbook page by page.

KEY WORDS:

STOMACH
DIGESTED
ESOPHAGUS
MUSCLES
GLANDS
LINING
DIGESTIVE JUICES
HYDROCHLORIC ACID
PEPSIN
FUEL
ENERGY
STOMACH ACHES
WALLS
CONTRACT
SMALL INTESTINE
BLOOD STREAM
ABSORBED
FATS
EXPAND
NUTRIENTS
WASTE
LARGE INTESTINE
ORGANS
LIQUIDS

MAIN POINTS:

1. The STOMACH is one of the body's important ORGANS.
2. The STOMACH serves as a storage place for food.
3. If you eat a large meal, it is stored in the STOMACH until it can be DIGESTED and sent to other places in the body.
4. Chewed food from the mouth goes down the ESOPHAGUS ("food tube").
5. When food starts to enter the ESOPHAGUS, the MUSCLES in the ESOPHAGUS begin to move in and out---up and down---carrying the food slowly to the STOMACH.
6. When you drink LIQUIDS the MUSCLES move . . but not as much as they do when solid food is moved.
7. There are many, many tiny GLANDS in the LINING of the STOMACH.
8. These GLANDS send DIGESTIVE JUICES into the STOMACH just as soon as it starts moving down through the ESOPHAGUS.
9. One of the DIGESTIVE JUICES in the STOMACH is HYDROCHLORIC ACID.
10. HYDROCHLORIC ACID is a very strong ACID that will dissolve many things in the STOMACH. (HYDROCHLORIC ACID is mixed with a material called PEPSIN.)
11. HYDROCHLORIC ACID and PEPSIN work together to break-down, or dissolve the chewed food into a "pulpy LIQUID". (When these DIGESTIVE JUICES have finished breaking-down the food "pulp", the materials in the food are used by the body for FUEL and ENERGY.)
12. Some of the causes for STOMACH ACHES may be "over-eating" or "mixing" the wrong kinds of foods together.
13. Sometimes a STOMACH ACHE may be caused by "eating too fast" and not chewing the food into small enough pieces.
14. Your STOMACH is the place where the food is stored while it is being changed by DIGESTIVE JUICES.
16. Some of the food that has been dissolved is then taken into the BLOOD STREAM and what is left is only partially DIGESTED.
17. This partially DIGESTED food is then moved to the SMALL INTESTINE.
18. More DIGESTION takes place in the SMALL INTESTINE.
19. The SMALL INTESTINE breaks-down FATS.
20. The MUSCLES in the SMALL INTESTINE squeeze and EXPAND (get larger) . . as DIGESTIVE JUICES and DIGESTED food are mixed together.
21. The WALLS of the SMALL INTESTINE are lined with many "finger-like" parts that are so small they can only be seen by a microscope.
22. In the SMALL INTESTINE, the food which has been turned into a LIQUID moves into the "finger-like" parts and on into the BLOOD STREAM.

LESSON 24 (continued)

23. When the NUTRIENTS from the food go into the BLOOD STREAM, the body uses it for growth and ENERGY.
24. What remains of the food is then sent to the LARGE INTESTINE.
25. The LARGE INTESTINE could stretch out to about 5 feet long.
26. The strong MUSCLES in the LARGE INTESTINE squeeze out all the remaining water in the UNDIGESTED food and turns it into a "soft-liquid".
27. This "soft-liquid" is then called WASTE.
28. MUSCLES move the WASTE to the end of the LARGE INTESTINE.
29. WASTE material stays in the end of the LARGE INTESTINE until the time comes for it to leave the body.
30. Every day the body must get rid of solid and LIQUID materials.

SUGGESTED ACTIVITIES:

1. Consult the Media Services Catalog for materials which will supplement this lesson.
2. Review how food gets into the STOMACH.
3. Discuss the purpose of the SMALL INTESTINE and LARGE INTESTINE.
4. Review the drawing on page 301.
5. Discuss why it is important that food be properly "chewed" before it is sent to the STOMACH.

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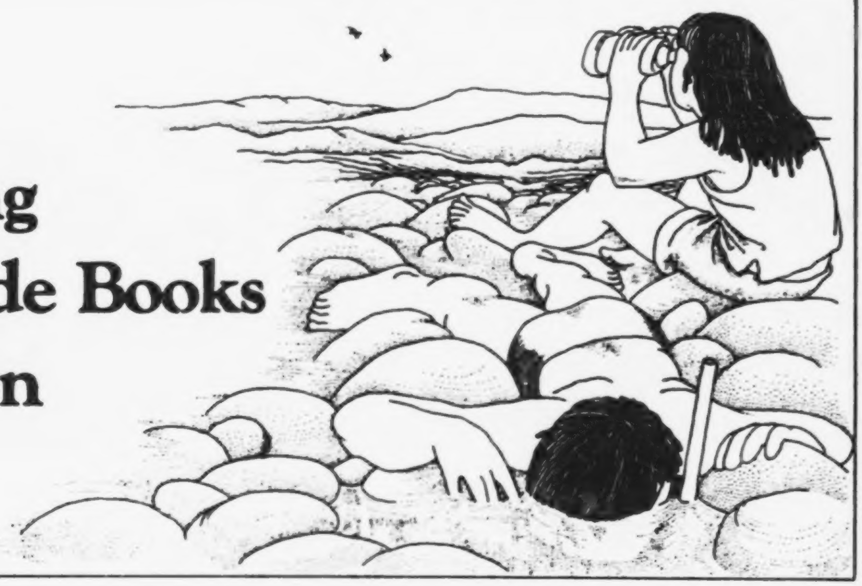
Science and Children

Outstanding Science Trade Books For Children in 1985



Max Karl Winkler

ALL WILD CREATURES WELCOME: THE STORY OF A WILDLIFE REHABILITATION CENTER. Patricia Curtis. Photographs by David Cupp. Lodestar. (5-8) 144 pp. ISBN 0-525-67164-1. A well-written, beautifully photographed, and often touching chronicle of the history and everyday operation of a wildlife rehabilitation center. The rehabilitation and release of orphaned, abandoned, injured, or sick raccoons, fawns, opossums, foxes, and birds are recounted through conversations with the people who care for them. Suggestions for ways to help injured wild animals and a list of wildlife rehabilitators are included. Bibliography. Index. SHB

ALZHEIMER'S DISEASE: THE SILENT EPIDEMIC. Julia Frank. Illustrated with diagrams and photographs. Lerner. (6-8) 80 pp. ISBN 0-8225-1578-4. A timely introduction to a frightening, highly publicized disease. Case histories of victims and their families are discussed. Dr. Frank describes current research, which has provided some answers, but she stresses that little is now known about the causes and treatment of Alzheimer's disease. Glossary. Index. NC

AMERICA'S BALD EAGLE. Hope Ryden. Photographs by the author. Putnam. (4-8) 64 pp. ISBN 0-399-21181-0. Hope Ryden, a naturalist-author-photographer, observes the habits of the bald eagle, discusses conservation programs such as "hacking" and raptor rehabilitation centers, and stresses the importance of the 1973 Endangered Species Act. A comprehensive study with excellent black-and-white photographs. Index. MMT

ANDY BEAR: A POLAR CUB GROWS UP AT THE ZOO. Ginny Johnston and Judy Cutchins. Photographs by Constance Noble. Morrow. (2-5) 64 pp. ISBN 0-688-05628-8. Paper ed., Scholastic. ISBN 0-590-40157-2. The introduction to this factual account is full of information about polar bears, and it sets the stage for the compelling story of the first year in the life of Andrew Nicholas Polar Bear. Andy was born on Christmas at the Atlanta (Georgia) Zoological Park and he was rescued from certain death by zookeeper Constance Noble. His growth and development are engagingly documented in both text and captivating photographs, most of them taken by Noble. Index. LLL

ANIMALS AT PLAY. Laurence Pringle. Illustrated with photographs. Harcourt Brace Jovanovich. (4-7) 80 pp. ISBN 0-15-203554-0. A fascinating look at the importance of animal play shown in such species as the cat, dog, wolf, bear, bat, and monkey. The text draws on studies by several ethologists. Excellent black-and-white photographs provide examples of familiar animals engaging in various kinds of play. Contains an excellent list for further reading. Index. HBO

ANNO'S HAT TRICKS. Akihiro Nozaki. Illustrated by Mitsumasa Anno. Philomel. (4 and up) 44 pp. ISBN 0-399-21212-4. An introduction to "if . . . , then . . . " thinking for those who enjoy intellectual puzzles, enlivened by Anno's charming illustrations.The early puzzles are fairly easy; succeeding ones grow in difficulty. Along the way, the author helps the reader cultivate a method for attacking logical puzzles. There is a note for parents and older readers to help them use the book with children. LG

BIKE FACTORY. Harold Roth. Photographs by the author. Pantheon. (4-6) 40 pp. ISBN 0-394-96507-8. Where do bicycles come from? Handlebars, pedals, spokes, and rims are assembled by skilled workers. The text and black-and-white photographs take us along the assembly line at a bicycle factory to watch a bicycle being put together out of more than 400 parts. JCK

BLACK-FOOTED FERRET. Denise Casey. Photographs by Tim W. Clark. Dodd. (3-6) 64 pp. ISBN 0-396-08625-X. Information about the physical characteristics, habits, life cycle, history, and future prospects of the elusive, near-extinct mammal, whose habitat and food sources are being eliminated. Based on a field study conducted in Wyoming. Excellent color and black-and-white photographs. Index. NC

BREAKTHROUGH: THE TRUE STORY OF PENICILLIN. Francine Jacobs. Illustrated with photographs. Dodd. (6-8) 128 pp. ISBN 0-396-08579-2. After briefly recounting the discoveries of Jenner, Pasteur, Lister and Koch, the author tells the complex story of penicillin's discovery. The popular misconception that Alexander Fleming was sole discoverer is corrected; and Howard and Ethel Florey, Ernst Chain, Norman Heatley, and many others are given the credit they deserve. The reader learns that scientific discovery is a consequence not only of remarkable insight and perseverance, but of time, place, and circumstance. Helpful photographs and notes. Bibliography. Index. LG

A CHILDREN'S ZOO. Tana Hoban. Photographs by the author. Greenwillow. (K-2) 24 pp. ISBN 0-688-05204-5. Outstanding color photography and book design mark this collection of photographs of ten zoo animals. Each two-page spread features a photograph accompanied by words describing three of the animal's distinguishing characteristics (for example, "gray," "wrinkled," and "trumpets" go with ELEPHANT). Most children enjoy identifying the animals and their attributes, and the book will give younger children a chance to review small and capital letters as well. A chart listing each animal's range, habitat, and diet is appended. NC

THE COMET AND YOU. E. C. Krupp. Illustrated by Robin Rector Krupp. Macmillan. (2-5) 48 pp. ISBN 0-02-751250-9. An imaginatively conceived look at comets, filled with up-to-date facts and historical data. Through similes and illustrations, the author and illustrator define and describe comets in relation both to other celestial bodies and to familiar objects (a sizzling ice cube, a suitcase crammed with comet tails, speeding trains, and flying hot dogs). SHB

THE DIGGING BADGER. Kathryn A. Minta. Illustrated with photographs. Dodd. (2-5) 64 pp. ISBN 0-396-08654-3. This readable and informative book presents details about the life cycle of the badger, including habitat, care and feeding of the young, and eating habits. Minta's prose, accompanied by numerous color photographs, communicates her compassion for wildlife and her firsthand knowledge of the badger. Index. LLL

"DINOSAURS" THAT SWAM AND FLEW. David C. Knight. Illustrated by Lee J. Ames. Prentice. (3-6) 64 pp. ISBN 0-13-214693-2. The profuse black-and-white drawings and compact text portraying many of the lesser-known reptiles that "swam and flew" will delight the dinosaur aficionado. Includes a list of U.S. and Canadian museums in which the remains of these animals can be seen. Index. HBQ

EAGLES. Joe Van Wormer. Photographs by the author. Lodestar. (4-7) 64 pp. ISBN 0-525-67154-4. The biology, behavior, and history of the American bald eagle and the golden eagle are presented in an informative and interesting text that should encourage a much-needed feeling of respect for this endangered animal. Wonderful black-and-white photographs. Index. DPL

ENVIRONMENT. David Cook. Illustrated with drawings. Crown. (4-7) 32 pp. ISBN 0-517-55428-3. *Environment* describes several distinct ecological systems inhabited by plants and animals adapted to the specific environments. Color illustrations supplement the text, and small world maps indicate the locations of these ecological systems. Emphasis is on conservation and endangered species. Good reference material. Index. Also recommended are three companion titles by Cook in the Our Endangered Earth series: **BIRDS,** ISBN 0-517-55431-3; **LAND ANIMALS**, ISBN 0-517-55430-5; and **OCEAN LIFE,** ISBN 0-517-55429-1. GOB

FLYING THE SPACE SHUTTLES. Don Dwiggins. Illustrated with photographs. Dodd. (4-8) 64 pp. ISBN 0-396-08510-5. Readers meet space shuttle astronauts through the informative, easy-to-read text and the color photographs from NASA and Rockwell International. A simple introduction answers many of the down-to-earth questions often asked about travel in the space shuttle. Detailed descriptions of the spacelab, working and walking in space, and space stations of the future provide fascinating reading. Chronological summary of early shuttle flights. Glossary. Index. SHB

FROM GRAPHITE TO PENCIL. Ali Mitgutsch. Illustrated by the author. Carolrhoda. (2-4) 24 pp. ISBN 0-87614-231-5. Lovely illustrations and a brief factual account describe how pencils are made, from the harvesting of cedar trees, through producing the graphite-clay mixture and placing it between wooden slats, to sanding and painting and, finally, adding erasers. One of the Start to Finish series. LG

GUESS WHAT? Beau Gardner. Lothrop. (K-3) 48 pp. ISBN 0-688-04983-4. Readers guess which animal is represented by looking at a detail from the animal's silhouette. They then check their predictions by turning the page. Gardner's book will encourage children to observe, attend to details, think, and make predictions. Some will probably also use the book as a model for creating their own "Guess What" silhouettes. Handsome graphics. LLL

GUINEA PIGS DON'T READ BOOKS. Colleen Stanley Bare. Photographs by the author. Dodd. (1-3) 32 pp. ISBN 0-396-08538-5. This delightful book presents the guinea pig as a friendly and inquisitive pet. The large print and vivid color photographs will appeal to young readers. Though brief, the text is adequate and informative, and it presents several characteristics and behaviors typical of guinea pigs. LLL

HOW THEY BUILT THE STATUE OF LIBERTY. Mary Shapiro. Illustrated by Huck Scarry. Random. (5 and up) 56 pp. ISBN 0-394-96957-X. This handsome volume is an absorbing account of the conception and creation of the well-known statue, with emphasis on the engineering processes involved. Huck Scarry's many detailed and well-researched drawings, with their lucid captions, are an integral part of the explanation of how the Statue of Liberty came to stand in New York Harbor. LBJ

IN MY GARDEN: A CHILD'S GARDENING BOOK. Helen Oechsli and Kelly Oechsli. Illustrated by Kelly Oechsli. Macmillan. (K-3) 32 pp. ISBN 0-02-768510-1. Delightful guide to growing vegetables written for young children. Covers planning, planting, care, harvesting, and composting. Includes a page each on seven favorite vegetables. Amusing and useful drawings throughout. JCK

INSIDE TURTLE'S SHELL: AND OTHER POEMS OF THE FIELD. Joanne Ryder. Illustrated by Susan Bonners. Macmillan. (3 and up) 64 pp. ISBN 0-02-778010-4. In their delicate brevity, these 41 poems about life in a meadow capture the essence and feeling of what flourishes in field and pond. The poems are beautifully arranged on pages where drawings most appropriately complement them. LBJ

IS THAT LARGER? IS IT SMALLER? Tana Hoban. Greenwillow. (K) 32 pp. ISBN 0-688-04028-4. This extraordinary multi-colored picture book for young children portrays familiar experiences and focuses on size comparisons between similar objects. Children will enjoy it as they practice observing, counting, comparing, discussing, and storytelling. MMT

ISAAC NEWTON: RELUCTANT GENIUS. D. C. Ipsen. Illustrated with photographs and drawings. Enslow. (5-8) 96 pp. ISBN 0-89490-090-0. A readable, straightforward biography of a man who is arguably the greatest scientist of all time. His discoveries relating to light and color, his development of the theory of gravity, and his formulation of calculus are presented in an accessible way. The author manages to convey a sense of the man as well as of the genius. Diagrams, portraits of Newton and many contemporaries, a chronology of Newton's life, and a short list for further reading are included in this book for middle school students. Index. HBQ

I TOUCH. Rachel Isadora. Illustrated by the author. Greenwillow. (K) 32 pp. ISBN 0-688-04256-2. Presents the way objects such as a teddy bear, cereal, a blanket, soap bubbles, or a mother feel or react to a very small child's touch. The few words and soft pastel illustrations make this very basic book a perfect choice for a shared experience between a young child and an adult. HBQ

A LOOK INSIDE CALCULATORS. Jan P. Haney. Illustrated with photographs and diagrams. Raintree. (4-8) 48 pp. ISBN 0-8172-1407-0. Through simple addition and multiplication problems, the inner workings of electronic calculators are examined. Clear, well-organized text and generous, detailed illustrations will help motivate readers to familiarize themselves with the uses and pleasures of calculators. Includes a chapter on the history of calculating machines and on calculator games and activities. Pronunciation guide. Glossary. Index. SHB

A LOOK INSIDE COMPUTERS. Paul G. Zomberg. Illustrated with photographs and diagrams. Raintree. (4-8) 48 pp. ISBN 0-8172-1409-7. A well-designed introduction to the world computers. Defines computers and discusses the history, components, languages, and uses of personal computers. The brief chapters present clear explanations and useful illustrations and diagrams. Pronunciation guide. Glossary. Index. JCK

MAKE IT GRAPHIC! DRAWING GRAPHS FOR SCIENCE AND SOCIAL STUDIES PROJECTS. Eve Stwertka and Albert Stwertka. Illustrated by Carol Hillman. Messner. (5-7) 64 pp. ISBN 0-671-54287-7. An introduction to graph making and the use of graphs to present data. Types of graphs—line, bar, pie, pictograph, and computer—are discussed in individual chapters. Bold line illustrations and diagrams encourage readers to experiment on their own. Index. NC

MEET THE MOOSE. Leonard Lee Rue, III, with William Owen. Photographs by Leonard Lee Rue, III. Dodd. (4-8) 80 pp. ISBN 0-396-08605-5. The words and photographs of an experienced and sensitive naturalist introduce the reader to the life and habitat of the magnificent moose. Chapters include "From Birth to Old Age," "The Range Today," "Moose Antlers," "Moose Enemies," and "Moose and People." The black-and-white photographs are superb. Index. MMT

MILK. Donald Carrick. Illustrated by the author. Greenwillow. (K-2) 24 pp. ISBN 0-688-04823-4. This beautifully illustrated book follows milk from the farm to the grocer's shelf. The large, clear print and carefully detailed full-page illustrations make this an excellent read-aloud book for young children. A delightful vicarious experience that can set the stage for a field trip to a dairy farm. LLL

THE MILK MAKERS. Gail Gibbons. Illustrated by the author. Macmillan. (3-4) 32 pp. ISBN 0-02-736640-5. From dairy to drink, this story of milk answers many of the questions elementary school children ask. Bold, full-page illustrations and short, clearly written comments explain how cows make milk and are milked as well as the various technical processes that take place before milk is delivered for use. GOB

MY FIRST KITTEN. Rosmarie Hausherr. Photographs by the author. Four Winds. (2-5) 48 pp. ISBN 0-02-743420-6. Written as though related by a seven-year-old boy, this factual account of selecting a kitten and seeing it through the months until it becomes a full-grown cat is an engaging introduction to the duties and pleasures of pet ownership. The text and appealing black-and-white photographs convey a great amount of information in an attractive way. A "What Parents Should Know" appendix about adopting kittens enhances the book's value. HBQ

NIGHT OF GHOSTS AND HERMITS: NOCTURNAL LIFE ON THE SEASHORE. Mary Stolz. Illustrated by Susan Gallagher. Harcourt Brace Jovanovich. (3-5) 48 pp. ISBN 0-15-257333-X. A blending of fiction and science. On a beach on the Gulf of Mexico, three brothers reluctantly leave their sandcastle. That night the seemingly peaceful shore comes to life as a ghost crab escapes a heron's notice, a whelk and a horse conch battle, a loggerhead turtle lays her eggs, and a hermit crab finds a new home. Soft, luminous illustrations capture the drama and beauty of the seashore after dark. Glossary. Bibliography. NC

THE NOVA SPACE EXPLORER'S GUIDE: WHERE TO GO AND WHAT TO SEE. Richard Maurer. Illustrated with photographs and diagrams. Clarkson Potter. (4-8) 128 pp. ISBN 0-517-55752-5. Companion book to the PBS television series dealing with space travel to the Moon and the near and far planets. Beautiful color and black-and-white NASA photographs, drawings, and diagrams invite a cover-to-cover read. Many single-topic boxes in each chapter appeal to the browser and young researcher. Index. JCK

NUCLEAR WAR: FROM HIROSHIMA TO NUCLEAR WINTER. Laurence Pringle. Illustrated with photographs and drawings. Enslow. (7 and up) 128 pp. ISBN 0-89490-106-0. The first half of this book comprises a lucid, carefully researched account of the history, technology, delivery systems, power, and accuracy of nuclear weapons. The second half examines, in accordance with the best current scientific information, the probable consequences of their use. If young readers are to be informed about the hazards of nuclear war and the urgent issue of disarmament, this is the best single source available. Photographs, maps, drawings, and recommended readings are included. Glossary. Index. LG

ONCE THERE WAS A TREE. Natalia Romanova. Illustrated by Gennady Spirin. Dial. (1-4) 24 pp. ISBN 0-8037-0235-3. An old tree stump is claimed by maggots, ants, a bear, and a man. All assume the stump is theirs, but who really owns it? A tree belongs to all. A simply written text, richly enhanced by Gennady Spirin's detailed drawings. LBJ

101 QUESTIONS AND ANSWERS ABOUT DANGEROUS ANIMALS. Seymour Simon. Illustrated by E. Friedman. Macmillan. (3-7) 96 pp. ISBN 0-02-782710-0. In question-and-answer form, the book satisfies children's natural curiosity about dangerous animals. Includes little-known facts and an examination of myths that surround traditionally feared species. Animals are discussed in the context of their environments, and human beings are presented as the most dangerous animals of all. Index. DPL

QUARTER HORSES. Dorothy Hinshaw Patent. Photographs by William Munoz and others. Holiday. (4-7) 96 pp. ISBN 0-8234-0573-7. Exciting black-and-white photographs and a clearly written, informative text make this a prize for anyone interested in the most popular breed of horse in the world. A short history of the quarter horse is followed by detailed descriptions of its many and varied activities. Places to write for more information and publications of interest are included. Glossary. Index. Also recommended is Patent's **THOROUGHBRED HORSES.** ISBN 0-8234-0558-3. GOB

RACEWAYS: HAVING FUN WITH BALLS AND TRACKS. Bernard Zubrowski. Illustrated by Roy Doty. Morrow. (4-8) 80 pp. ISBN 0-688-04159-0. Paper ed., Morrow. ISBN 0-688-04160-4. Activities that are educational and enjoyable demonstrate velocity and acceleration with easy-to-follow directions, accompanied by simple diagrams and background information. Basic knowledge of electricity is helpful for setting up some of the activities, and activities may require purchasing some equipment. Children (and adults) will have great fun building and designing raceways as they learn. DPL

SATELLITES OF TODAY AND TOMORROW. Jack R. White. Illustrated with photographs and drawings. Dodd. (5 and up) 128 pp. ISBN 0-396-08514-8. The book discusses the history, types, construction, and current and possible future uses of satellites. Includes sections on weather, rescue, and spy satellites, as well as discussions of OSCAR, LANDSAT, and future space stations. Photographs and diagrams enhance the text. An excellent resource. DPL

SATURN. Seymour Simon. Illustrated with photographs. Morrow. (1-4) 32 pp. ISBN 0-688-05799-3. Features large NASA photographs in color and several illustrations of the spectacular ringed planet. Concise, up-to-date information gathered by Voyager I about Saturn's surface, rings, and the 9 largest of its 20 (so far) moons. A beautiful first planet book for young readers. The book is in the same format as Simons' *The Moon*, recommended in the 1984 edition of this list. JCK

SAVING THE PEREGRINE FALCON. Caroline Arnold. Photographs by Richard R. Hewett. Carolrhoda. (3 and up) 48 pp. ISBN 0-87614-225-0. An outstanding account of scientists' ingenious efforts to increase the population of the endangered peregrine falcon. The peregrine falcon's strength and beauty are conveyed through striking color photographs and clearly written text. Part of the Carolrhoda Nature Watch series. Glossary. SHB

SEASON OF THE WHITE STORK. Heiderose Fischer-Nagel and Andreas Fischer-Nagel. Photographs by the authors. Carolrhoda. (3 and up) 48 pp. ISBN 0-87614-242-0. Although these interesting birds are not residents of North America, children will get to feel well acquainted with them through this beautiful, well-written book. Large close-up photographs capture the details of the comings and goings of stork families. Glossary. Index. Also recommended from the Nature Watch series is the Fischer-Nagels' **LIFE OF THE HONEYBEE.** ISBN 0-87614-241-2. GOB

THE SEVEN SLEEPERS: THE STORY OF HIBERNATION. Phyllis S. Busch. Illustrated by Wayne Trimm. Macmillan. (3-6) 72 pp. ISBN 0-02-715650-8. A simple treatment of the three ways animals cope with northern winters. Emphasis is placed on the "seven sleepers" (the woodchuck, little brown bat, jumping mouse, bear, chipmunk, skunk, and raccoon). But other animals that hibernate, birds and animals that migrate, and animals that remain active are also discussed. A final chapter asks, "Can Human Beings Hibernate?" Index. HBQ

THE SHARK WATCHERS' GUIDE. Guido Dingerkus. Illustrated by Dietrich Bürkel. Messner. (5-8) 144 pp. ISBN 0-671-50234-4. Paper ed., Wanderer. ISBN 0-671-55038-1. Readers can develop new understanding of and respect for sharks through clear text and excellent illustrations. The book describes the characteristics, habits, and environments of various species—there are more than 300—and discusses their relationship to human beings. Glossary. Bibliography. Index. GOB

THE SHEEP BOOK. Dorothy Hinshaw Patent. Photographs by William Munoz. Dodd. (3-5) 80 pp. ISBN 0-396-08607-1. Beginning with a beautiful description of the birth of a lamb, the reader is introduced to sheep ranching and topics such as judging a good wool sheep and the various breeds of sheep raised in America. The text is clearly written. The black-and-white photographs are appealing. Index. GOB

SNOWFLAKES. Joan Sugarman. Illustrated by Jennifer Dewey. Little. (4-6) 64 pp. ISBN 0-316-82112-8. Snowflake shapes—stars, needles, feathers, pyramids—are discussed and illustrated with pen-and-ink drawings. Clear explanations of how crystals are formed and a succinct summary of the study of snowflakes throughout history are presented. Readers also learn how to catch a snowflake. Glossary. LBJ

SOAP BUBBLE MAGIC. Seymour Simon. Illustrated by Stella Ormai. Lothrop. (1-4) 48 pp. ISBN 0-688-02685-0. Simple questions and instructions and lovely illustrations add educational significance to a popular activity by encouraging children to observe more carefully, experiment with surface tension, and enjoy some of the optical effects created by soap bubbles. Also recommended is Simon's **SHADOW MAGIC.** ISBN 0-688-02682-6. LG

SOMEONE SAW A SPIDER: SPIDER FACTS AND FOLKTALES. Shirley Climo. Illustrated by Dirk Zimmer. Crowell. (4-7) 144 pp. ISBN 0-690-04436-4. Retellings of Greek, Japanese, American Indian, and European spider folktales are given scientific legitimacy in a text that demonstrates the connection between science and the humanities. An excellent compendium of spider facts is appended to the final chapter. Bibliography. SHB

THE STORY OF YOUR HAND. Alvin Silverstein and Virginia B. Silverstein. Illustrated by Greg Wenzel. Putnam. (5-8) 80 pp. ISBN 0-399-61212-2. A brief account of the hand's evolution is followed by a thorough introduction to the structure and functions of our remarkable hands. There is a chapter on left- and right-handedness and one on signing. Includes helpful drawings and experiments the reader can do. Index. LG

TALES MUMMIES TELL. Patricia Lauber. Illustrated with photographs. Crowell. (5 and up) 128 pp. ISBN 0-690-04389-9. Outstanding black-and-white photographs illustrate this fascinating account of how the study of mummies has helped scientists answer many questions about our ancestors. Natural mummies, such as those preserved in peat bogs and desert sand, as well as the funerary mummies of ancient Egypt and Peru are examined. Bibliography. Index. NC

TAZO AND ME. Lynn Hall. Photographs by Jan Hall. Scribner. (5-8) 48 pp. ISBN 0-684-18305-6. The text and the black-and-white photographs by the author's sister present a well-balanced documentary account of a rider's choosing, caring for, showing, and taking pleasure in owning a Paso Fino horse. LBJ

TUNNELS. Sam Epstein and Beryl Epstein. Illustrated with photographs and drawings. Little. (5-8) 120 pp. ISBN 0-316-24573-9. A history of tunnels and a discussion of techniques involved in digging tunnels. Aqueducts, canals, railroad, and underwater tunnels are explained. Famous tunnels around the world are discussed in detail. Black-and-white drawings and photographs complement this useful reference work. Glossary. Index. DPL

WALLABY CREEK. Joyce Powzyk. Illustrated by the author. Lothrop. (3-6) 32 pp. ISBN 0-688-05693-8. Observations of a naturalist at work in the Australian bush are presented in carefully written text with superb watercolor illustrations. The reader is introduced to such animals as the cockatoo, the kookaburra, the wallaby, and the kangaroo. MMT

WHAT GOOD IS A TAIL? Marlene M. Robinson. Illustrated with photographs. Dodd. (2-4) 48 pp. ISBN 0-396-08487-7. A simple, informative text, illustrated with black-and-white photographs, describes the appearance and function of many kinds of animal tails: the tail of an alligator helps it to move silently and swiftly through the water; the scorpion uses its tail for defense; the peacock spreads its tail to attract a mate. Questions, clues, and close-ups are used to stimulate the reader's thought and imagination and encourage careful observation of animals with tails. Index. MMT

WHAT'S FOR LUNCH? THE EATING HABITS OF SEASHORE CREATURES. Sam Epstein and Beryl Epstein with Michael Salmon. Illustrated by Walter Gaffney-Kessel. Macmillan. (3-6) 48 pp. ISBN 0-02-733500-3. Do you know what a sea squirt eats? Or even what one looks like? The eating habits and physical characteristics of 20 seashore animals are described. Beautiful black-and-white drawings. Index. DPL

WHEN THE TIDE IS LOW. Sheila Cole. Illustrated by Virginia Wright-Frierson. Lothrop. (K-3) 32 pp. ISBN 0-688-04067-5. While waiting for low tide, an inquisitive and impatient youngster directs a barrage of questions at her mother, and the two discuss what they will find at the beach when the water recedes. Delightful watercolor illustrations support the text. An excellent resource to use in getting children ready for a trip to the beach. Illustrated glossary of seashore animals. LLL

WHERE THE WAVES BREAK: LIFE AT THE EDGE OF THE SEA. Anita Malnig. Illustrated with photographs. Carolrhoda. (3 and up) 48 pp. ISBN 0-87614-226-9. Readers tour the ocean's edge to observe life in shallow waters, in tide pools, and elsewhere along the shore. A challenging, well-written text and superb color photographs depict plants and animals such as seaweed, periwinkle, starfish, sponge, and jellyfish. Part of the Carolrhoda Nature Watch series. Index. MMT

WOLF OF SHADOWS. Whitley Strieber. Sierra Club/Knopf. (6 and up) 112 pp. ISBN 0-394-94224-4. A novel about a mother and daughter who survive the aftermath of a nuclear war when they are accepted by a wolf pack. The story incorporates scientific speculation about the radiation sickness, food shortage and social chaos, and the nuclear winter that would follow nuclear war. The imaginative use of an animal narrator presents a fresh view of human beings. An alarming, important book that should be read and discussed. JCK

WOLF PACK: TRACKING WOLVES IN THE WILD. Sylvia A. Johnson and Alice Aamodt. Illustrated with photographs and drawings. Lerner. (5-8) 96 pp. ISBN 0-8225-1577-6. This book traces the development of wolves from pups. Discusses social development and communication within a family group and includes chapters on tracking wolves and myths surrounding wolves. A well-written, interesting, and informative account with excellent photographs and illustrations. Glossary. Index. DPL

CRITERIA FOR SELECTION

The books that appear in this annotated bibliography were selected as outstanding children's science trade books published in 1985. They are aimed primarily at grades K-8 and were evaluated by a special book review subcommittee (see below) appointed by NSTA in cooperation with the Children's Book Council.

Selection is generally based on three criteria: the book is accurate; it is readable; and its format and illustrations are pleasing. Information in a book selected for the list is *consistent with current scientific knowledge*. In areas where scientists differ, a book should present different points of view, and information should not be distorted by personal biases or values. Facts and theories must be clearly distinguished, generalizations supported by facts, and significant facts not omitted. If experiments are a feature of a book, the committee considers whether they lead to an understanding of basic principles. Moreover, experiments must be appropriate for the readers' age group and be both feasible and safe. The committee eschews anthropomorphized animals and plants. It also has a bias against books that are racist, sexist, or extol violence.

Each annotation is initialed by the person who wrote it. Although the books are read by many committee members, annotations do not reflect the judgment of all committee members. The appropriate grade level of each book is given in parentheses. International Standard Book Numbers (ISBNs) are included. If a publisher has both a library and trade edition, we include the ISBN for the library edition. Three titles on the list are currently available in paperback as well as hardcover editions; ISBNs for both editions are included. Other titles may appear in paperback format in the future.

The Committee notes with interest the increasing number of titles for very young children that are appropriate for this list. In a few instances, books designated for kindergarten and primary school children would also be appreciated by even younger children and their guardians.

The Book Review Committee is appointed by NSTA in cooperation with The Children's Book Council, Inc., a nonprofit association that encourages the reading and enjoyment of children's books and sponsors National Children's Book Week. CBC cooperates on reading development projects with several national associations including NSTA. Current members of the Book Review Committee are

GLENN O. BLOUGH, chair, professor emeritus of science education, University of Maryland, College Park

STEPHEN H. BAUMANN, elementary teacher, Hutchinson Elementary School, Fairfax County Public Schools, Herndon, Virginia

NANCY CURTIN, children's librarian, Port Washington (New York) Public Library

LAZER GOLDBERG, professor of science and mathematics, Hofstra University, Hempstead, New York

LELAND B. JACOBS, professor emeritus of education, Teachers College, Columbia University, New York City

JOAN CRESSLER KARASICK, science library media specialist, Greenwich (Connecticut) High School

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HARRIET B. QUIMBY, library consultant, West Falmouth, Massachusetts

MYRTLE M. TOWNSEND, consultant, New Jersey State Department of Education, Trenton

Bibliography

General reference and "whole language" approach

Carin, Arthur and Robert Sund. *Teaching Modern Science.* Columbus, Ohio: Charles E. Merrill Publishing Co., 1980.

Goodman, Kenneth. *Language and Literacy, the Selected Writings of Kenneth Goodman.* London: Routledge and Kegan Paul, 1982.

Hansen, Jsnr, Thomas Newkirk, and Donald Graves, eds. *Breaking Ground.* Portsmouth, N.H: Heinemann Educational Books, Inc., 1985.

Holdaway, Don. *The Foundations of Literacy.* Sydney: Ashton Scholastic, 1979.

Huck, Charlotte and Doris Kuhn. *Children's Literature in the Elementary School.* New York: Holt, Rinehart and Winston, Inc., 1968.

Newman, Judith M., ed. *Whole Language Theory in Use.* Poersmouth, N.H.: Heinemann Educational Books, Inc., 1985.

Smith, Frank. *Reading Without Nonsense.* New York: Teachers College, Columbia University, 1978.

Science Activity Books

Abruscato, Joseph and Jack Hassard. *The Earth People Activity Book: People, Places, Pleasures and Other Delights.* Glenview, Ill.: Scott, Foresman and Co., 1978.

_______________. *Loving and Beyond: Science Teaching for the Humanistic Classroom.* Glenview, Ill.: Scott, Foresman and Co., 1976.

______________. *The Whole Cosmos Catalog of Science Activities. Glenview, Ill.: Scott, Foresman and Co., 1978.*

Carin, Arthur and Robert Sund. *Discovery Activities for Elementary Science.* Columbus, Ohio: Charles E. Merrill, 1980.

Cornell, Joseph Bharst. *Sharing Nature with Children.* Nevada City, Ca.: Amanda Publications, 1979.

Mitchel, John, ed. *The Curious Naturalist.* Englewood Cliffs: Prentice Hall, 1980.

Outdoor Biology Instructional Strategies (OBIS). Nashua, NH: Delta Education, 1982.

Summary

We hope children will no longer see science or any subject as the mere acquisition of facts to be regurgitated at the proper time. Children's interest is highest when they enter school. If we can capture it at that point with interesting, exploratory methods of doing things and nuture it throughout the elementary years, we should have a new generation of students who will not be alienated from science. They will be scientifically and technologically aware of their surroundings as no previous generation has been. They are our children and we have accepted a challenge to teach them to be thinking adults. Our approach was designed to help you implement these goals.

Bibliographies of Children's Books

Arbuthnot, May Hill. Children's Books Too Good to Miss. Cleveland: Press of Case Western Reserve University, 1979.

Brodart Co. The Elementary School Library Collection, Fifteenth Edition. Williamsport Pa.: Brodart Co., 1986. An excellent professional source. This publication should be owned by every elementary school library. It is a very complete listing of children's books.

Children's Books in Print. New York: R.R. Bowker, 1972.

Cranciolo, Patricia. Picture Books for Children. Chicago: American Library Association, 1973.

Deason, Hilary. The AAAS Science Booklist for Children. Washington: American Association for the Advancement of Science, 1983.

Eakin, Mary. Subject Index to Books for Primary Grades, 3rd ed. Chicago: American Library Association, 1967.

Gillespie, John and Christine Gilbert. Best Books for Children: Preschool through the Middle Grades, 2nd ed. New York: R.R.Bowker, 1981.

Leina, Carolyn. A to Zoo: Subject Access to Children's Picture Books. New York: R.R.Bowker Co., 1982.

Subject Guide to Children's Books in Print. New York: R.R. Bowker, 1981.

Sutherland, Zena (ed.) Best in Children's Books. Chicago: University of Chicago Press, 1973.

Trelease, Jim. The Read Aloud Handbook. New York: Penguin Books, 1982.

Our Favorite Science Children's Literature

Alexander, Lloyd. The King's Fountain. New York: E. P. Dutton and Co., 1971. (A rich king wants to build a gorgeous fountain which will cut off the water supply to his subjects. Eventually a poor man convinces him of the folly of his idea).

Barrett, Judi. Animals Should Definitely Not Wear Clothing. New York: Athenesson, 1984. (Adaptation of animals to environment)

Buscaglia, Leo. The Fall of Freddie the Leaf. New York: Holt, Rinehart and Winston, 1982. (Falling leaves illustrate the delicate balance between life and death).

Burton, Virginia. Mike Mulligan and his Steam Shovel. New York: Houghton, Mifflin, 1939. (Mike finds out what machines can do for us)

Carle, Eric. The Mixed Up Chameleon. New York: Thomas Crowell, 1975. (A very bored chameleon wants to be like other animals, but when he is transformed, he no longer can survive).

Carle, Eric. Grouchy Ladybug. New York: Thomas Crowell, 1977. (The ladybug is very grouchy and every hour of the day she takes out after another animal. Eventually she is humbled by a whale).

Carle, Eric. The Very Busy Spider. New York: G. P. Putnam, 1984. (A fun way to learn about spiders activities.)

Goudry, Alice. The Day We Saw the Sun Come Up. New York: Scribners, 1961. (Rotation of the earth and topographical features affect weather and length of day).

Keats, Ezra Jack. The Snowy Day. New York: Viking Press, 1962. (Peter delights in the qualities of the snow).

Krauss, Ruth. The Carrot Seed. New York: Harper and Row, 1945. (Seeds can be sprouted under various conditions).

Fisher, Aileen. Up, Up the Mountain. New York: Thomas Crowell, 1968. (One can study mountain ecology and the effects of weather as one hikes up a mountain).

Kumin, Maxine. The Beach Before Breakfast. New York: Putnam, 1964. (Many shells and animals are left on the beach to be classified).

Lionni, Leo. The Biggest House in the World. New York: Pantheon, 1970. (A snail happily lives on a cabbage leaf carrying its house on its back. Another snail wants a bigger house so the first snail tells a story of snails who wanted a huge shell and of the disaster that resulted).

Lionni, Leo. Fish is Fish. New York: Pantheon, 1970. (A tadpole turns into a frog and goes out into the world. Later when he returns to the pond he tells a minnow of the various creatures while the minnow imagines them each as modifications of his own body).

Lionni, Leo. Swimmy. New York: Pantheon, 1968. (The schooling behavior protects fish in a beautiful but dangerous world under the sea).

McCloskey, Robert. Blueberries for Sal. New York: Viking Press, 1948. (Human beings and wild animals live strangely parallel lives).

Mayer, Mercer. Professor Wormbog and the Zipperump-a-Zoo. New York: Golden Press, 1976. (Outrageously sized and shaped animals have adapted to their environment).

Miles, Miska. Wharf Rat. New York: Little, Brown and Co., 1972. (A rat struggles to survive an oil spill).

Miller, Edna. Mousekin's Woodland Birthday Party. Englewood Cliffs, N.J., 1974. (The life cycle of the mouse is excellently detailed from conception throughout life).

Pollock, Penny. The Slug who Thought he was a Snail. New York: G. P. Putnam's Sons, 1980. (The slug thinks he has lost his house and goes off to look for it. Finally he finds another slug who tells him the truth.)

Raskin, Ellen. Spectacles. New York: Atheneum, 1968. (Iris Fogel didn't always see well--her eyes played strange tricks on her. Her visit to the eye doctor is portrayed along with the great improvement she has after she gets glasses).

Ryder, Joanna. Simon Underground. New York: Harper Row, 1976. (The life of the mole show us about their environment; soil composition)

Selsam, Millicent. Terry and the Caterpillars. New York: Harper and Row, 1962. (All about catrerpillars and llife cycles.)

Shaw, Charles. It looked like Spilled Milk. New York: Harper and Row, 1947. (Rorschach type sploches look like various items but turn out to be a cloud).

Silverstein, Shel. The Giving Tree. New York: Harper and Row, 1964. (The tree has much to offer the boy throughout his life).

Tresselt, Alvin. The Beaver Pond. New York: Lothrop, 1970. (The intricacies of the beaver's house are detailed as well as its effect on the environment of the entire pond).

Yolen, Jane. All in the Woodland Early. Cleveland: William Collins, 1979. (Rhythm and rhyme help learn the names of North American birds, animals and insects. A song is included.)

Van Allsburg, Chris. The Wreck of the Zephyr. New York: Houghton Mifflin, 1983. (Seacoast ecology and geology; mechanics of sailing)

Urdy, Janice. A Tree is Nice. New York: Harper Row, 1956. (A living tree has many purposes)

Revised 2/8/86 JWB-CMB

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Science and the Language Arts Conference
March 1, 1986

"Choosing and Reading Trade Books to Teach Science" M.J. Klingerman

MAGAZINES AND JOURNALS

BOOKLIST, American Library Association, Chicago, Ill. semi-monthly
Current buying list of recent books and non-print media with brief annotations. Included only recommended materials.

BULLETIN OF THE CENTER FOR CHILDRENS BOOKS, University of Chicago, Chicago, Ill.
10 times a year.
A review journal of books for children ages four to fourteen. Covers about 75 titles per month, which are evaluated by both educators and librarians. Recommendations are both favorable and negative.

HORN BOOK MAGAZINE, Horn Book Incorporated, Boston, Mass. 6 times a year.
Indispensable to teachrs and librarians for articles on authors and illustratiors and discriminating reviews.

SCHOOL LIBRARY JOURNAL, Bowker, New York, 10 times a year.
Most widely used by school librarians for its numerous book reviews and its articles and news about librarianship.

STANDARD BIBLIOGRAPHIES

CHILDREN'S CATALOG, H.W. Wilson Co., New York.
A basic bibliography of materials for K-6. Useful for adding materials for better readers and for locating specific information through the use of the analytical index.

ELEMENTARY SCHOOL LIBRARY COLLECTION, Brodart, Williamsport, Penn.
A classified catalog of recommended print and audio visual materials for library media centers serving pre-school through sixth grade children.

SCIENCE PERIODICALS
OF INTEREST TO ELEMENTARY TEACHERS

APPRAISAL: SCIENCE BOOKS FOR YOUNG PEOPLE, Appraisal, Boston, Mass.
Believes that science books deserve the same careful attention as literary works for children and that they should be entirely worthy of a child's attention.

CURIOUS NATURALIST, Massachusetts Audubon Society. Quarterly
Designed to interest children in natural history. Hand lettered and illustrated.

CURRENT SCIENCE, Xerox Education Publication. Fortnightly.
Developments in the various science disciplines as well as experiments, puzzles and games.

SCIENCE AND CHILDREN, National Science Teachers Association.
Directed specifically to the elementary school teacher.

SCIENCE BIBLIOGRAPHIES

BEST SCIENCE BOOKS FOR CHILDREN, American Association for the Advancement of Science, Washington, D.C. 1983, 271 p.
Recommended children's books, arranged by bhe Dewey classification system.

SCIENCE BOOKS FOR CHILDREN, American Library Association, 1985, 183p.
Reflects the best science trade books reviewed in BOOKLIST from the year 1976 through 1983. Annotated.

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